Zurlo The Tanganyika Cichlid Aquarium ISBN 0-764

A Complete Pet Owner's Manual
The Tanganyika Cichlid Aquarium
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BARRON'S

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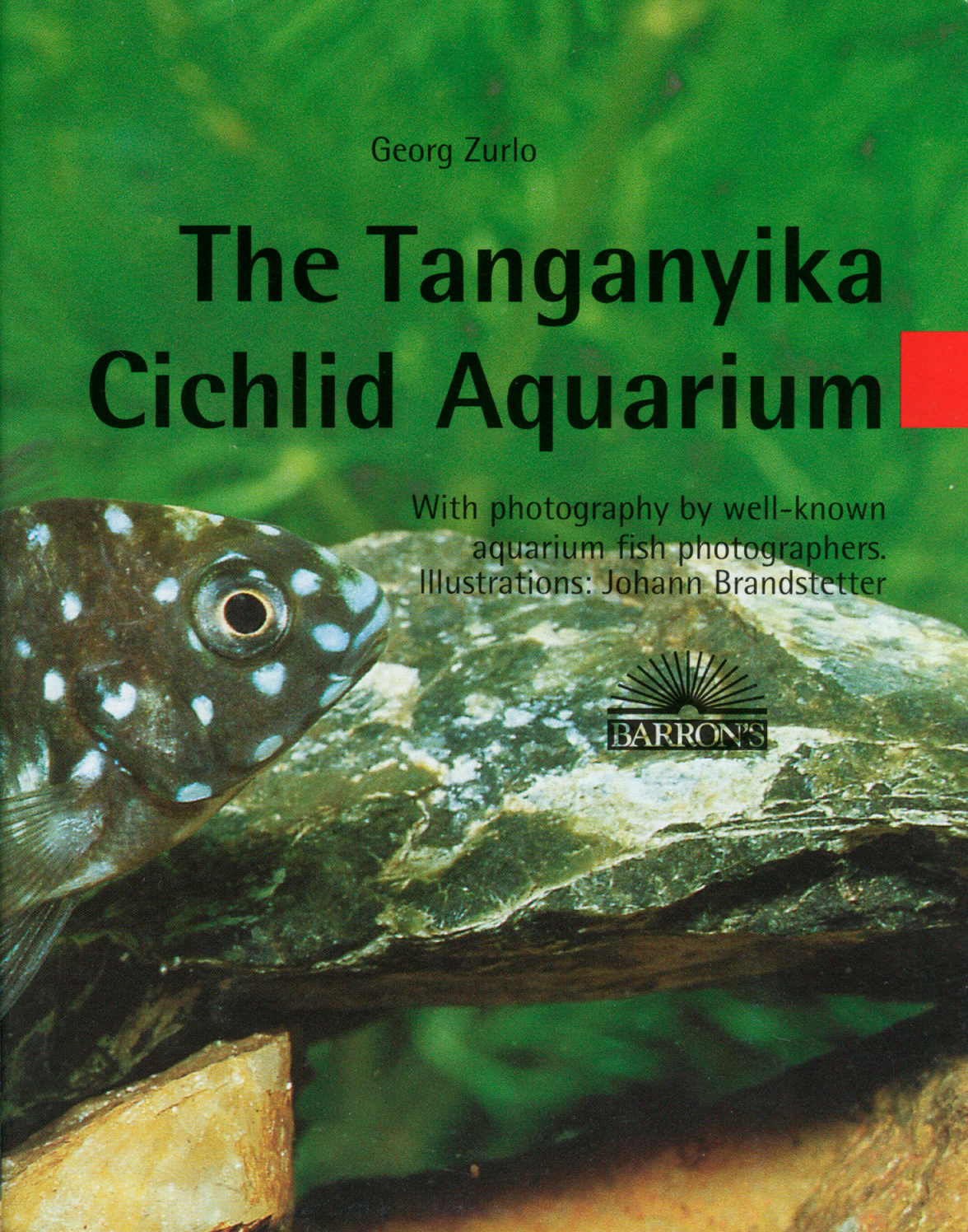
Georg Zurlo

# The Tanganyika Cichlid Aquarium

With photography by well-known aquarium fish photographers.
Illustrations: Johann Brandstetter



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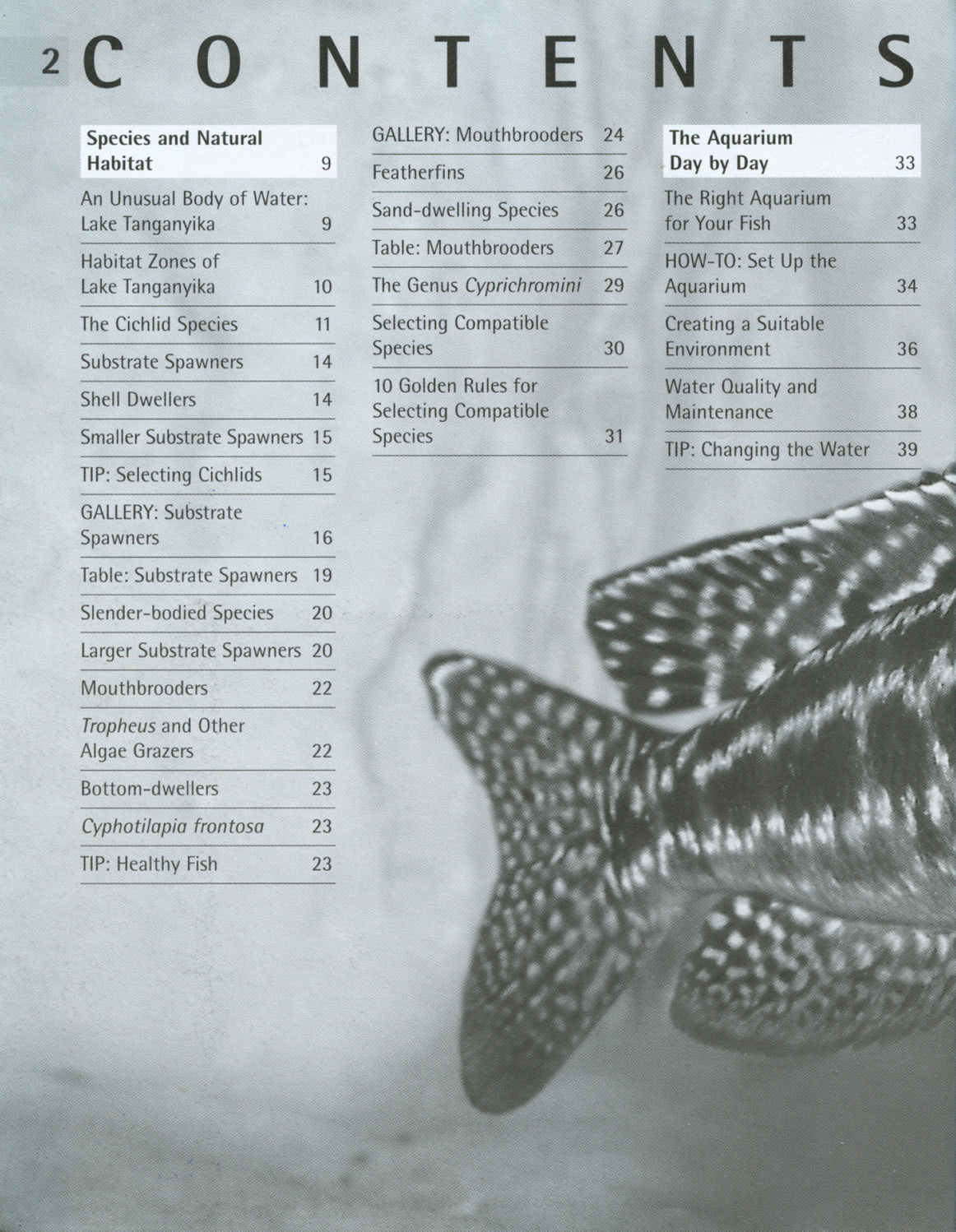

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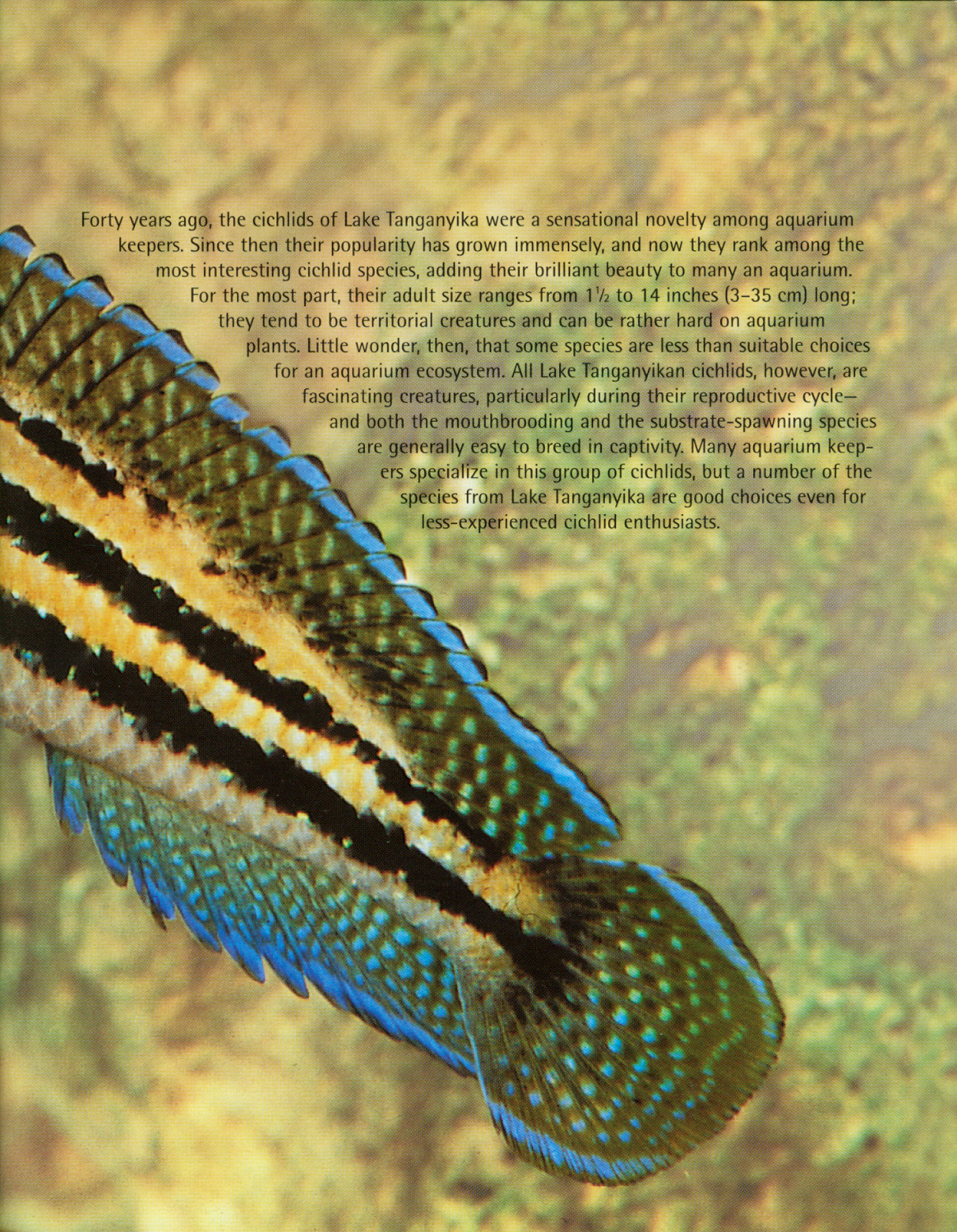
# TYPICAL LAKE TANGANYIKAN CICHLIDS

- Fascinating behavior.
- Wide variety of colors, shapes, and sizes.
- Often territorial.
- Not always compatible with other cichlids.
- Interesting reproductive behavior.
- Sexes usually difficult to distinguish.
- Substrate spawners or mouthbrooders.
- Can be bred in captivity.
- Many variations in markings and habitat.
- Not always easy to keep with plants.



Forty years ago, the cichlids of Lake Tanganyika were a sensational novelty among aquarium keepers. Since then their popularity has grown immensely, and now they rank among the most interesting cichlid species, adding their brilliant beauty to many an aquarium. For the most part, their adult size ranges from 1½ to 14 inches (3–35 cm) long; they tend to be territorial creatures and can be rather hard on aquarium plants. Little wonder, then, that some species are less than suitable choices for an aquarium ecosystem. All Lake Tanganyikan cichlids, however, are fascinating creatures, particularly during their reproductive cycle—and both the mouthbrooding and the substrate-spawning species are generally easy to breed in captivity. Many aquarium keepers specialize in this group of cichlids, but a number of the species from Lake Tanganyika are good choices even for less-experienced cichlid enthusiasts.

# 6 FACTORS IN YOUR DECISION

**1** Is your aquarium big enough? Only a few species of Lake Tanganyikan cichlids will thrive in small tanks (see page 14).

**2** Do you value an aquarium with abundant plants? Lake Tanganyikan cichlids can often be hard on plants (see page 40).

**3** Lake Tanganyikan cichlids need the very best dried and frozen food if they are to reproduce in captivity.

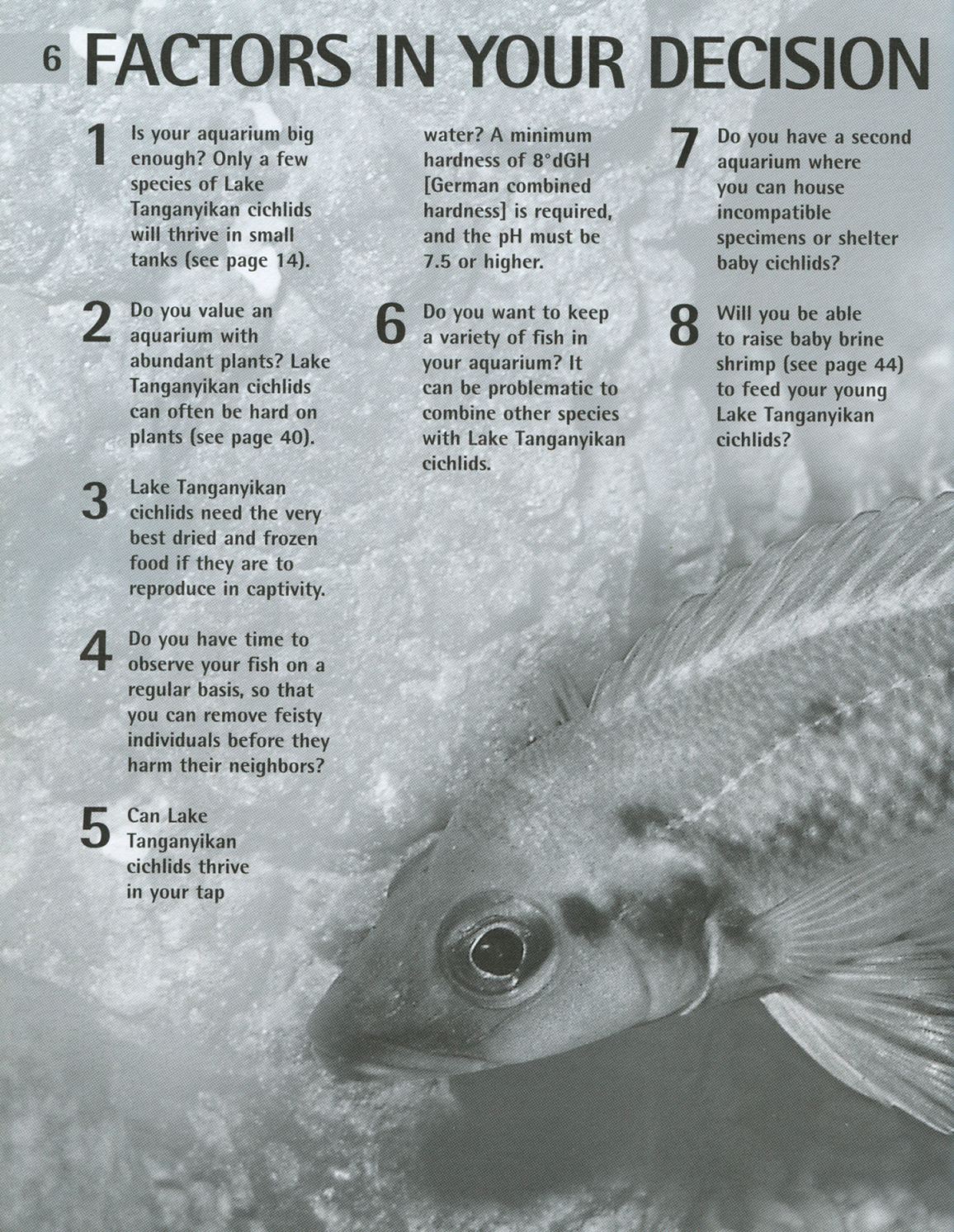
**4** Do you have time to observe your fish on a regular basis, so that you can remove feisty individuals before they harm their neighbors?

**5** Can Lake Tanganyikan cichlids thrive in your tap water? A minimum hardness of 8°dGH [German combined hardness] is required, and the pH must be 7.5 or higher.

**6** Do you want to keep a variety of fish in your aquarium? It can be problematic to combine other species with Lake Tanganyikan cichlids.

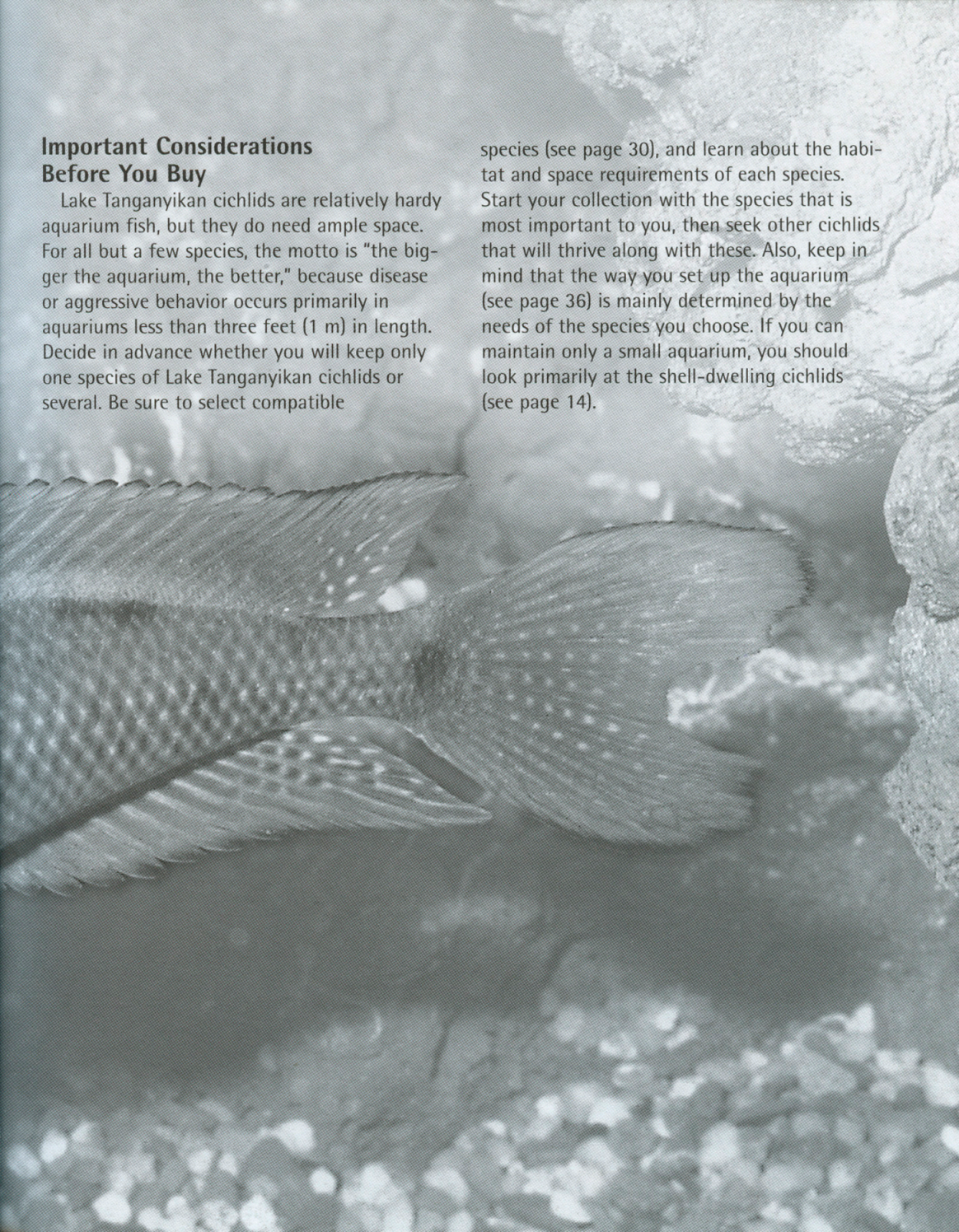
**7** Do you have a second aquarium where you can house incompatible specimens or shelter baby cichlids?

**8** Will you be able to raise baby brine shrimp (see page 44) to feed your young Lake Tanganyikan cichlids?



## Important Considerations Before You Buy

Lake Tanganyikan cichlids are relatively hardy aquarium fish, but they do need ample space. For all but a few species, the motto is "the bigger the aquarium, the better," because disease or aggressive behavior occurs primarily in aquariums less than three feet (1 m) in length. Decide in advance whether you will keep only one species of Lake Tanganyikan cichlids or several. Be sure to select compatible species (see page 30), and learn about the habitat and space requirements of each species. Start your collection with the species that is most important to you, then seek other cichlids that will thrive along with these. Also, keep in mind that the way you set up the aquarium (see page 36) is mainly determined by the needs of the species you choose. If you can maintain only a small aquarium, you should look primarily at the shell-dwelling cichlids (see page 14).



# SPECIES AND NATURAL HABITAT

*Lake Tanganyika, in east-central Africa, is home to almost 200 species of cichlids that are found nowhere else in the world. These fish are lively and often aggressive, but also splendidly colored and fascinating in their behavior.*

## An Unusual Body of Water: Lake Tanganyika

Lake Tanganyika is in many respects a sea of superlatives: At 420 miles (680 km) long, it is the world's longest freshwater lake, and at 4,708 feet (1,500 m) the second deepest; only Russia's Lake Baikal is deeper. Although extremely elongated—ranging from 10 to 42 miles (16–70 km) in width—it covers about 12,700 square miles (nearly 33,000 $km^2$), making it the second largest lake in east Africa and the sixth largest in the world. The lake actually forms the border between Tanzania on the east and Congo on the west. Burundi in the north and Zambia in the south also border on Lake Tanganyika.

**History:** Lake Tanganyika was formed more than ten million years ago as the oldest part of the east African rift system, which extends from the Red Sea to Lake Malawi. It lies at about 2,500 feet (775 m) above sea level and much of its shoreline is mountainous.

**Neolamprologus buescheri.** ***The upper fish is threatening the lower fish, which pulls in its fins and tail to indicate submission.***

Many small rivers feed into the lake, but it has only one outlet: the Lukuga River at Kalemie in the west, which flows into the Congo. In the past, the water level rose and fell dramatically, so that at times there was no outlet at all. For long periods, the water level was so low that the northern, central, and southern sections of the lake existed as three separate bodies of water.

### The Water of Lake Tanganyika

Only the upper 325 to 650 feet (100 to 200 m) of Lake Tanganyika contains oxygen, which is essential for higher life forms. Because the temperature varies very little at different depths, there is hardly any exchange of water between the individual levels. Only under unusual circumstances does turbulence bring to the upper levels water from the deep that contains no oxygen. Such events can kill large numbers of fish.

In the inhabited levels, the water's physical and chemical parameters are largely constant throughout the lake. Naturally, the aquarium keeper will strive to keep conditions in the aquarium as similar as possible to those of its

occupants' natural habitat. In the shallow areas, the water temperature is approximately 80°F (27°C); in the deeper regions, it drops no more than 5°F (3°C) below that.

**Rich in minerals:** Most of the water flowing into Lake Tanganyika is rich in minerals. Much of this water evaporates under the tropical sun. Therefore, it is not surprising that Lake Tanganyika's water has an extremely high mineral content. This is reflected in several water parameters:

✔ The electrical conductivity is about 600 mS [microSiemens]; the German combined hardness lies between 10 and 12°dGH; the carbonate hardness is between 15 and 18°kH. The aquarium water should be enriched with minerals correspondingly. When selecting decorations for an aquarium sheltering Lake Tanganyikan cichlids, a calcareous substrate (coral sand or crushed oyster shells) is a good choice.

✔ The high calcium content makes the lake water definitely alkaline, with pH at least 7.5 and usually greater than 8.0. Materials that acidify the water, such as peat or resinous pinewood from bogs, are therefore out of place in a Lake Tanganyika aquarium.

## Habitat Zones of Lake Tanganyika

The *rocky zone* hugging the shoreline is the most important habitat for cichlids in Lake Tanganyika. Depending on how steeply the shoreline drops off, the size of the underwater boulders, whether they are bare or partly covered with sand and deposits, and how deep they lie, these regions present a wide variety of living conditions for the cichlids they shelter.

✔ The rocks provide hiding places, spawning sites, and feeding grounds for the fish, thereby determining all the important life processes.

✔ At depths of 50 feet (15 m) and less, the rock is thickly covered with algae that provides food for herbivorous cichlids (see page 22). They dominate in this zone.

✔ Deeper in the lake, the rocks are more covered with sand and deposits. Species that live on crustaceans, insect larvae, and small fish find better hunting here.

✔ The innumerable crevices and crannies form caves in which some species of cichlids find safety for themselves and their eggs and young. On the other hand, the species that

***Transition zone in Lake Tanganyika: The rocky coast offers abundant hiding places, while the sandy area features sparse vegetation.***

practice mouthbrooding prefer flat rocks and stones in protected coves for their spawning grounds.

The *sandy zone* is a completely different habitat. It may occur in shallow waters near the shore, or deeper in the lake where the shoreline is rocky; it offers neither hiding places nor protected spawning sites, and vegetation is also lacking. These areas are home to the mouthbrooding species that build sand pits or nests for spawning (see page 26), as well as the small shell-dwelling cichlids that use empty snail shells as hiding places and brooding shelters (see page 14).

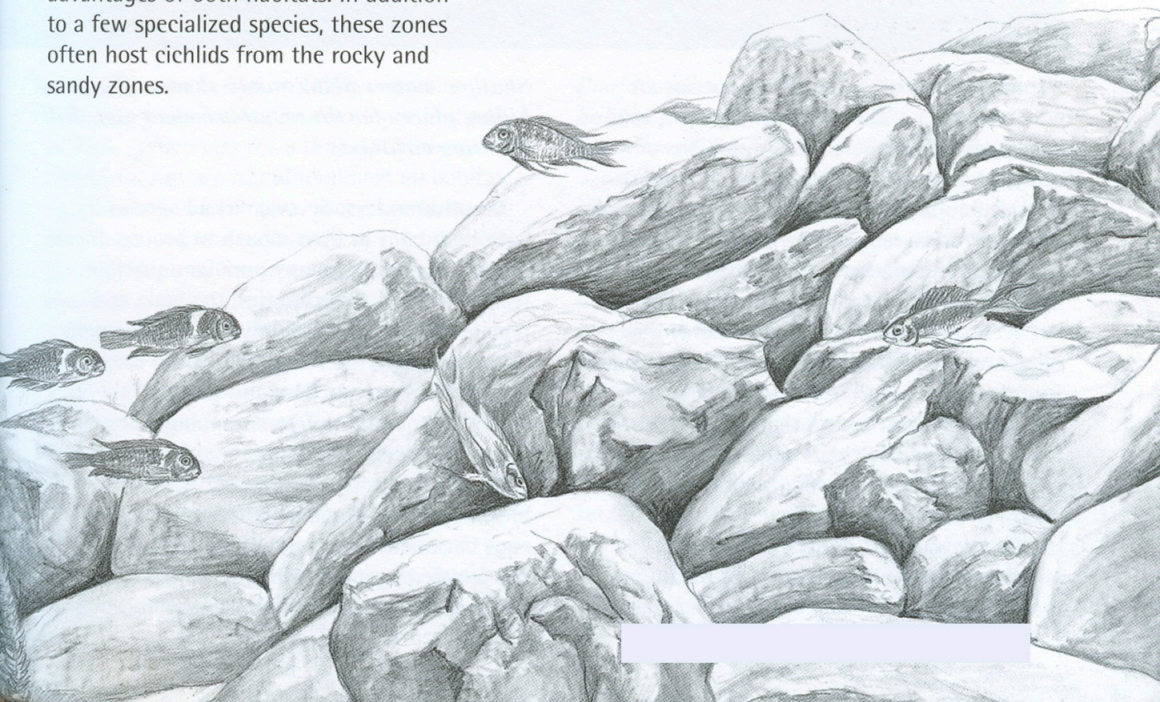
In addition to *rocky and sandy zones,* there are other regions that cannot be assigned strictly to either habitat. These include sandy areas with isolated rocks or boulder formations and scree slopes within which are some sandy areas. Such transition zones combine the advantages of both habitats. In addition to a few specialized species, these zones often host cichlids from the rocky and sandy zones.

The *open water* in the vicinity of rocks or over a rocky bottom is home to the cichlid tribe *Cyprichromini* (see page 29). In similar territory, though farther from shore, live the large predators of the genus *Bathybates*, which feed on fish and are not good candidates for the home aquarium.

Because *vegetated zones* in Lake Tanganyika are rare and isolated, plants play at most a subordinate role in the life of the lake's cichlids. In the aquarium, plants are entirely unnecessary. The few cichlid species that prefer vegetated areas are not very interesting and are only rarely offered for sale.

## The Cichlid Species

The isolated location of Lake Tanganyika, in combination with its extreme water conditions, has fostered the development of a particularly wide variety of fish species, and especially of



cichlids. Almost all these cichlid species are endemic—that is, they are found only in Lake Tanganyika. Over the course of millions of years, a variety of living, feeding, and reproductive habits developed. Many species include variants in different locations and with different colors and markings. Greater specialization in the search for food has reduced competition between species. Furthermore, a highly developed brooding behavior protects the offspring from predators.

**Open brooders:** Only a single species of Lake Tanganyikan cichlids does not hide its eggs at all. This species, *Boulengerochromis microlepis,* is the world's largest species of cichlid, growing to 32 inches (80 cm) in length, and hence it is difficult to maintain in captivity.

***Shallow waters along sandy shores offer scant hiding places for the mouthbrooders and shell-dwelling cichlids.***

**Mouthbrooders:** Several cichlid species incubate their eggs in their mouth to protect them. This group includes many popular aquarium fish. In most of these species, the male and female remain together only during spawning; after spawning, the females incubate the eggs, and in many species they also protect the young after they are free swimming. Other mouthbrooders form temporary or permanent pairs and take turns caring for their offspring. In some species, the male and female pass the eggs back and forth many times; in others, the female begins brooding, then passes the young embryos to the male halfway through

*Boulder piles near the shore are a preferred habitat for algae grazers and for the juveniles of many other cichlid species.*

the incubation period. In this group as well, many species continue to tend the free-swimming juveniles for a time. Mouthbrooding cichlid species are found in almost all habitat zones of Lake Tanganyika: rocky, sandy, transition, and open water. Outside of the brooding period, they may live in colonies or groups or singly, depending on the species.

*Substrate spawners* likewise have occupied almost all the biotopes of Lake Tanganyika. Their variety of living habitats rivals that of the mouthbrooders. They live among large boulders, on scree piles, or on sandy bottoms, and they spawn on the lake bottom in a wide variety of hollows—from narrow rock crevices, to spacious niches, to the empty shells of aquatic snails. They tend their young in various family configurations—as a parental pair, in a harem, or in large breeding colonies. Many species continue to protect and guide their young after they are free swimming; others guard them only indirectly, by defending the territory they share.

The cichlids that come from Lake Tanganyika to our aquariums are remarkable fish. Once an oddity prized by specialists, then increasingly popular though still unusual, they have now become a standard offering of aquarium retailers. Nevertheless, their intriguing and varied behavior patterns make them a fascinating subject of observation for any aquarium enthusiast.

## Substrate Spawners

Although the substrate-spawning cichlids of Lake Tanganyika include a few sizeable predators *(Lepidiolamprologus)*, most species remain small and are well suited for the aquarium. They belong to the genera *Neolamprologus* (more than 50 species!), *Julidochromis*, *Chalinochromis*, *Altolamprologus*, *Telmatochromis*, and *Lamprologus*. The latter also includes species that live outside Lake Tanganyika. For the aquarium hobbyist, it is useful to sort these substrate-spawning species into groups requiring similar care.

## Shell Dwellers

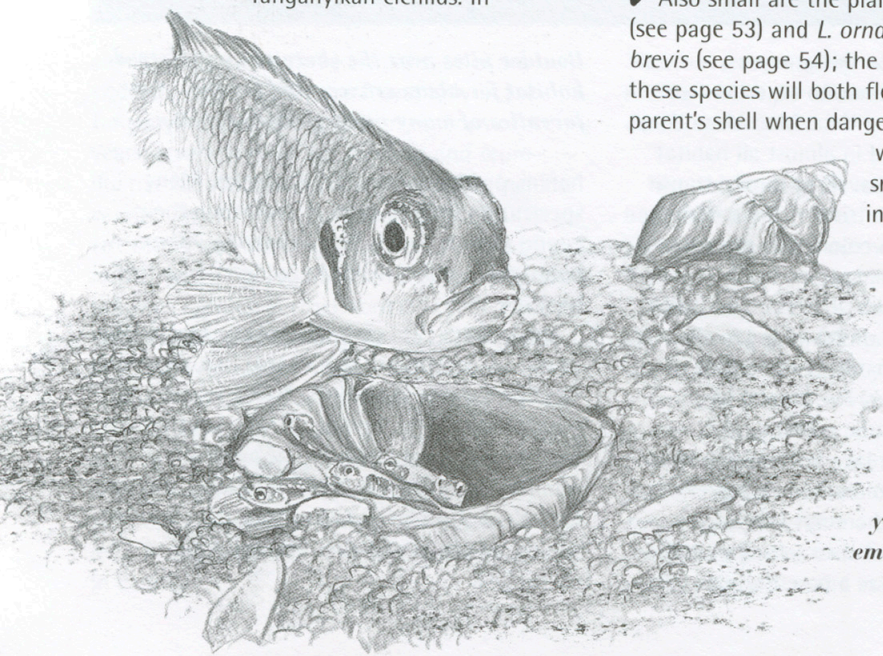
These cichlid species use the empty shells of aquatic snails as hiding places and breeding caves. They live over sandy bottoms in the transition zone to rocky regions. These species include the smallest substrate-spawning cichlids and the smallest of all Lake Tanganyikan cichlids. In almost all of these species, the adult male is definitely larger than the female.

✔ The most popular are *Neolamprologus multifasciatus* and *Lamprologus ocellatus*. *N. multifasciatus* (see page 16) and the similar species *N. similis* grow to at most 1.2 to 1.6 inches (3–4 cm) long and tend to form harems. With time, a small group can develop into an entire colony, because several generations of offspring are reared simultaneously.

✔ *L. ocellatus* and similar species *(L. speciosus, L. meleagris)* grow somewhat larger—the male to 2 inches (5 cm), the female to 1.4 inches (3.5 cm). They are best kept in pairs. In an aquarium that is more than 4 feet (120 cm) in length, it may be possible to keep one male with a harem, or several pairs. The juveniles of these species will dart into the female parent's shell when danger threatens; this is tolerated for a time, but shortly before the next spawning they will be driven off.

✔ Also small are the plain-hued *L. signatus* (see page 53) and *L. ornatipinnis* as well as *N. brevis* (see page 54); the male and female of these species will both flee into the female parent's shell when danger threatens. In the wild, *L. signatus* lives in small sandy hollows, but in the aquarium it will occupy a snail shell.

✔ Species that grow significantly larger include *L. callipterus* (see page 17),



***Shell-dwelling cichlid* (Lamprologus ocellatus) *guards his young in a snail shell embedded in the sand.***

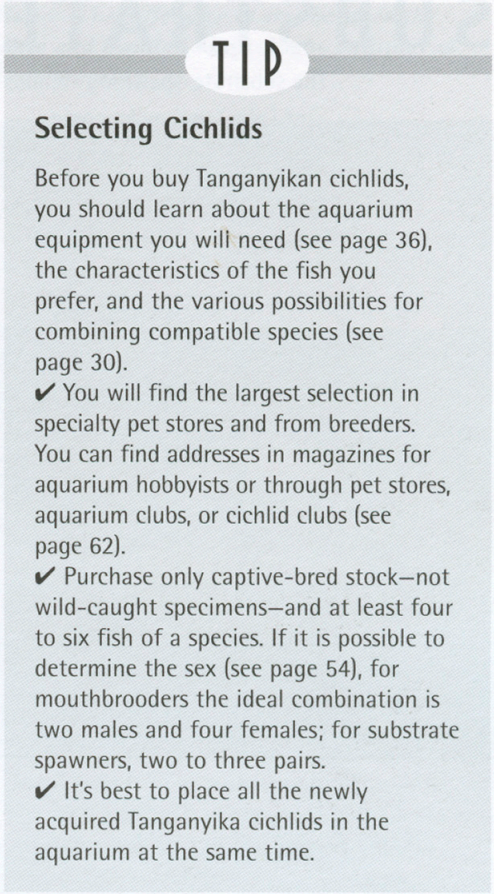
*N. boulengeri* (see page 36), and *N. meeli.* The adult males of these species will no longer fit into a snail shell. The size difference between male and female is especially pronounced in *L. callipterus*; the females grow to 2 inches (4–5 cm) long and the male to 5 inches (13 cm) long.

✔ *Telmatochromis* sp. (common name "Vittatus Shell") and *Altolamprologus* sp. ("Sumbu" = "compressiceps") live in groups where there are plenty of snail shells. Cichlids of the species *T. burgeoni* prefer to live in pairs.

**Aquarium conditions:** Because they are small, shell-dwelling cichlids can be kept in relatively small aquariums. A group of *N. multifasciatus* will even make do with an aquarium whose base is 24 × 16 inches (60 × 40 cm). Be sure to provide plenty of empty snail shells (the shells of edible snails will do). Some species, such as *N. similis*, are flexible and will use a rocky cave. All of the shell-dwelling species listed above can also be kept in a larger community aquarium with other Lake Tanganyikan cichlids (see page 30), as long as the other species do not also need a sandy habitat. In large aquariums—more than 5 feet (150 cm) long—it is also possible to maintain several species of shell dwellers together.

*Diet:* All types of dry, frozen, or live food (see page 42). Baby brine shrimp are especially suitable.

*Breeding:* If healthy and well nourished, all shell-dwelling cichlids will reproduce readily on their own in captivity. In the case of species that live in groups, the male will spawn with the females in his harem one after another. The female tends the eggs, while the male defends the territory. The species that live in pairs follow the same division of labor.




## Smaller Substrate Spawners

*(Neolamprologus and Telmatochromis)*

Both in Lake Tanganyika and in the aquarium, the smaller substrate spawners of the genus *Neolamprologus* are especially abundant. They live in rocky regions or transition zones, and although the individual species are quite different in appearance, their care requirements are similar.

# GALLERY: SUBSTRATE SPAWNERS

The substrate-spawning cichlids of Lake Tanganyika come in many different shapes and colors. They live in pairs or in groups.

*Above: Bright gold,* **Neolamprologus longior** *is especially eye-catching.*

*Above:* **Neolamprologus multifasciatus,** *smallest of the species. The males spread their fins and tail to look intimidating.*

*Above:* **Julidochromis regani** *grows relatively large, with an elongated body.*

*Above:* **Neolamprologus cylindricus** *has striking bold stripes.*

*Above:* **Neolamprologus tretocephalus,** *identifiable by its five vertical bars.*

*Above: The female* **Altolamprologus calvus** *is always smaller than the male.*

*Below: The difference in size between the male and female* **Lamprologus callipterus** *is astonishing.*

*Above: Elongated fin tips add graceful lines to* **Neolamprologus brichardi** *and to a few other closely related species.*

*Left: The bulging forehead of* **Telmatochromis burgeoni** *makes him look fierce, and indeed he can be so.*

## Smaller Substrate Spawners (cont'd.)

✔ With its graceful shape, elongated fins, and delicate color, *N. brichardi* (the "Princess of Burundi") is a true beauty. Numerous very similar species are also sold: *N. pulcher, N. savoryi, N. obscurus,* and *N. caudopunctatus* have long been known to aquarium enthusiasts, whereas *N. splendens, N. falcicula, N. crassus, N. gracilis,* and *N. olivaceus* have been described only in recent years.

✔ Other important small substrate spawners resemble two slender-bodied species that are often mistaken for each other: *N. longior* (see page 16) and *N. leleupi. N. buescheri* (see page 8) and *N. cylindricus* (see page 16) have been known for some time; *N. mustax, N. petricola,* and *N. niger* are rarely offered for sale, and *N. nigriventris, N. bifasciatus* and *N. pectoralis* are recently described species.

✔ Also small are a few *Telmatochromis* species: *T. vittatus* and *T. bifrenatus* have elongated bodies and lateral bands, distinguishing them from the higher-backed *T. dhonti* and *T. temporalis.*

**Aquarium conditions:** Your fish need ample space and a range of rocky crevices like that found in Lake Tanganyika.

✔ Pile up smooth, flat rocks (for example, pieces of slate) so that they form caves and passageways of different sizes. Or place a large flat rock on the sandy bottom; the fish will dig hollows under it.

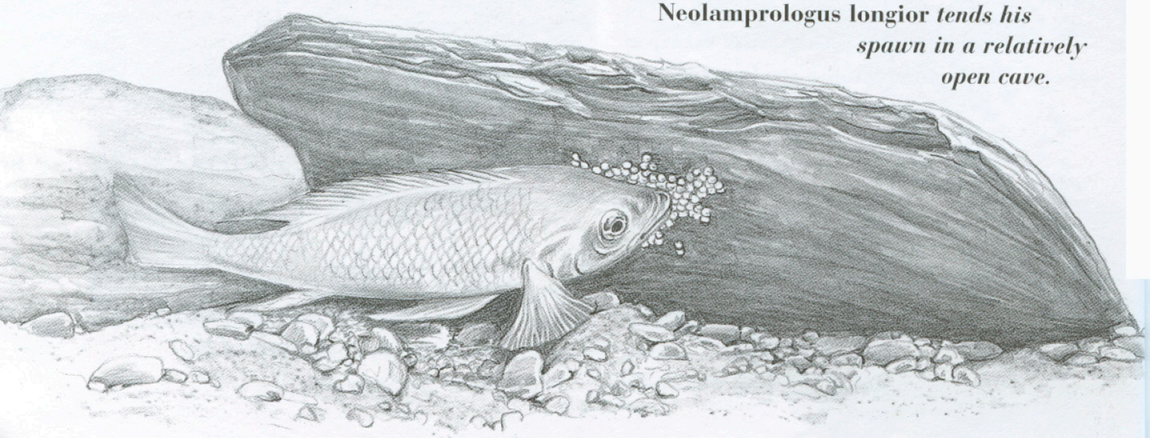
✔ Begin with groups of at least five juveniles. When pairs form, you can move them to a breeding aquarium.

✔ A large aquarium can accommodate several pairs. However, you should choose species that are as different as possible and provide plenty of hiding places so that aggressive behavior doesn't get out of hand.

**Diet:** The smaller substrate spawners can be fed all the standard dried, frozen, and live fish foods (see page 42). Live baby brine shrimp are especially good for these species.

**Breeding:** It can be difficult to distinguish the sexes in juveniles of the small substrate-spawning species. For *Neolamprologus* and *Telmatochromis,* the male is generally larger and clearly dominates the female. In many species, pairs form strong bonds, although they can also easily disintegrate into unpredictable quarrels.

Usually, the eggs are laid on the roof of the cave, and only the female tends the spawn. The parents continue to offer free-swimming fry indirect protection by allowing them to remain



**Neolamprologus longior** *tends his spawn in a relatively open cave.*

## Substrate Spawners from Lake Tanganyika

| Scientific Name | Size Male/ Female | Ratio* of Males to Females | Aquarium Size** | Preferred Shelter or Spawning Site | Species Requiring Similar Care (photo on page) |
|---|---|---|---|---|---|
| *Neolamprologus multifasciatus* Photo, page 16 | 1.8/1.2 inches (4.5/3 cm) | 1 m/2 f (colony) | 24 inches (60 cm) | snail shell | *N. boulengeri* (36) and *brevis* (40); *Lamprologus ocellatus* (21) and *callipterus* (17) |
| *Telmatochromis burgeoni* Photo, page 61 | 2.5 inches (7 cm) | 1 m/1 f | 32 inches (80 cm) | snail shell | *Telmatochromis* sp.; *Altolamprologus* sp. "Sumbu" |
| *Julidochromis marlieri* Photo, page 20 | 6 inches (15 cm) | 1 m/1 f (1 m/2 f) | 32 inches (80 cm) | shallow cave | All *Julidochromis* and *Chalinochromis* |
| *Neolamprologus cylindricus* Photo, page 16 | 5 inches (12 cm) | 1 m/1 f | 32 inches (80 cm) | shallow cave | *N. buescheri* (8) and *caudopunctatus; Telmatochromis dhonti* |
| *Neolamprologus brichardi* Photo, page 17 | 4 inches (10 cm) | 1 m/1 f (colony) | 32 inches (80 cm) | shallow cave | *N. gracilis* and *pulcher* |
| *Neolamprologus longior* Photo, page 16 | 4 inches (10 cm) | 1 m/1 f | 32 inches (80 cm) | shallow cave | *N. leleupi, mustax* (9), and *obscurus* |
| *Neolamprologus sexfasciatus* Photo, page 53 | 6 inches (15 cm) | 1 m/1 f | 40 inches (100 cm) | wide cave | *N. tretocephalus* (17), *furcifer* (6), and *tetracanthus* (48) |
| *Altolamprologus compressiceps* Photo, page 64 | 6 inches (15 cm) | 1 m/1 f | 40 inches (100 cm) | wide cave or snail shell | *A. calvus* (17); *Neolamprologus fasciatus* |
| *Lepidiolamprologus kendalli* Photo, page 2 | 7 inches (18 cm) | 1 m/1 f | 40 inches (100 cm) | wide cave | Other *Lepidiolamprologus* |

* Sex ratio: optimum and (maximum)
** Minimum aquarium size for one species

within their fiercely defended territory. Juveniles of different ages (from successive spawns) may share the same spawning site and territory. Older juveniles may even help tend the new eggs. When the juveniles reach a certain size, however, the parents drive them out of the immediate area. In a larger aquarium, the offspring of one pair of cichlids can form several colonies in this process.

## Slender-bodied Species

The genus *Julidochromis* includes some of the most popular and longest-known Lake Tanganyikan cichlids. These fish and those of the genus *Chalinochromis* typically have slender elongated bodies. They too inhabit the rocky zones and transition zones.

✔ The *Chalinochromis* species and two of the *Julidochromis* species *(J. marlieri, J. regani)* grow larger than other slender-bodied species *(J. ornatus, J. transcriptus, J. dickfeldi).* All the *Julidochromis* species have site-specific variants (for example, *J. regani* "Kipili," *J. transcriptus* "Gombi").

✔ Only two of the *Chalinochromis* species, *C. brichardi* and *C. popelini*, have been scientifically described. The juveniles of *C. brichardi* have lateral bands until they are about 1 inch (2.5 cm) long, as do the juveniles of *C.* sp. "Bifrenatus" and *C.* sp. "Ndobhoi."

*Aquarium conditions and diet:* Similar to the requirements for small *Neolamprologus* species.

**Breeding:** Among *Chalinochromis*, the male is often larger than the female; in *Julidochromis* species, the reverse is often the case. The ability to maintain a pair is critically determined by the territory they share. Changes in their environment—sometimes even changing the water—can cause them to separate. The eggs are deposited on the wall or roof of a cave, and both parents tend the spawn.

## Larger Substrate Spawners

The needs of *Altolamprologus, Lepidiolamprologus,* and larger *Lamprologus* are significantly different from those of the smaller substrate spawners. Because of their size, large substrate spawners require a more spacious aquarium and heartier high-protein food; a few species feed on fish. Their behavior also differs from that of their smaller relatives. Many species do not spawn in narrow caves, but rather deposit their eggs on the walls of larger caverns or rock crevices. The cichlids described in this group vary widely in size and appearance.

✔ *Altolamprologus calvus* and *A. compressiceps*, the most commonly kept species, are high-backed and—like *Neolamprologus fasciatus*—narrow-bodied. Distinctly more robust in appearance are *N. sexfasciatus* (see page 53), *N. tretocephalus* (see page 17), and *N. pleuromaculatus.* All these species grow to approximately 6 inches (15 cm) in length.

✔ *N. tetracanthus* (see page 48), *N. lemairii,* and most of the *Lepidiolamprologus* species grow

**Julidochromis marlieri** ***is slender, with distinctive "checkerboard" markings.***

**Lamprologus ocellatus**, *the most popular of the shell-dwelling cichlids, rarely ventures far from the safe haven of its home.*

even larger—up to 12 inches (30 cm) long—and feed on fish. Although *Lepidiolamprologus attenuatus, L. nkambae, L. elongatus* and *L. kendalli* are attractively colored, they are only occasionally kept as aquarium fish.

**Aquarium conditions:** The larger substrate spawners require an aquarium at least 4 feet (120 cm) long, with spacious rocky caves. From a small group of juveniles, pairs may form; these can be moved to a separate aquarium, at least 32 inches (80 cm) long, for breeding. These cichlids might eat other aquarium fish that are small enough to be regarded as prey.

**Diet:** Juveniles can be fed the same diet as smaller substrate spawners. Older specimens, however, particularly *N. lemairii* and *Lepidiolamprologus*, need high-protein food such as shrimp or bits of fish or mollusks.

**Breeding:** It can be difficult to breed the larger substrate spawners in captivity. *Altolamprologus* prefer to spawn in snail shells that are large enough for the female to swim inside. *N. pleuromaculatus* and *L. attenuatus* also spawn in smaller shells. Other species generally spawn on the walls of rocky caves or in crevices.

## Mouthbrooders

About two thirds of Lake Tanganyikan cichlids practice mouthbrooding. A number of these species are not good candidates for aquarium life; these include the genera *Perissodus* and *Plecodus*, which feed on the scales of other fish, and the larger predators such as *Bathybates* or *Haplotaxodon*. Also rarely chosen are *Reganochromis*, *Triglachromis*, and *Gnathochromis*, because their coloration is not particularly attractive. Most mouthbrooding species, however, are splendidly colored and interesting fish, quite popular among cichlid enthusiasts. They prefer to inhabit the rocky zone; only a few species have adapted to live in the sandy regions or in open water.

Because most mouthbrooding species do not form pairs, it is always advisable to maintain several females with one male. Only for the few pair-bonding species should there be an equal number of males and females.

## Tropheus and Other Algae Grazers

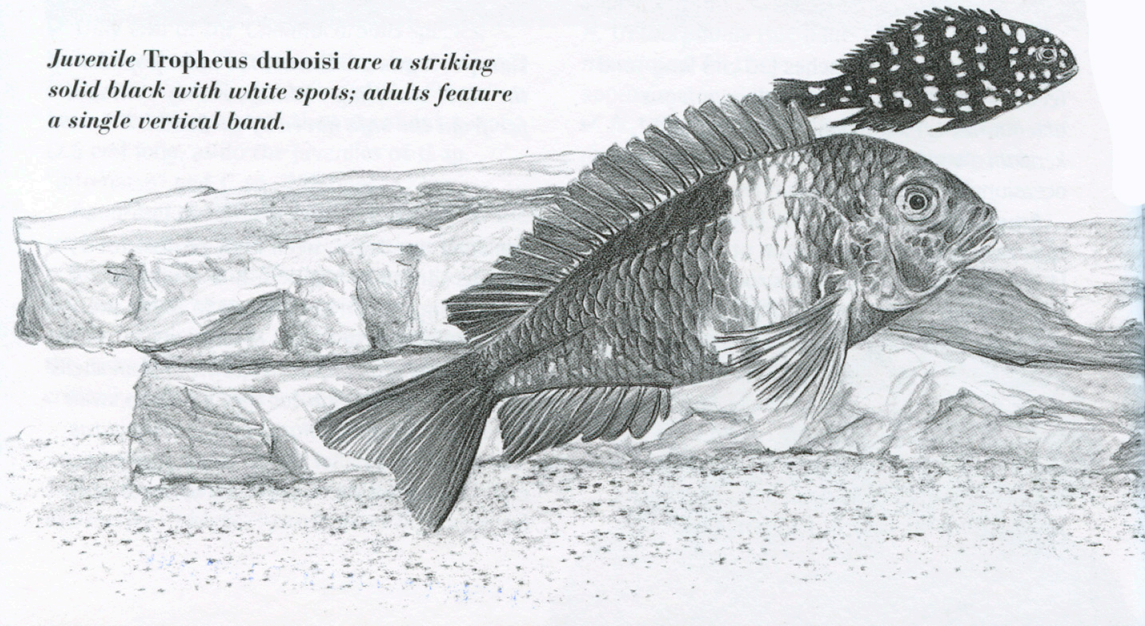
✔ The best-known and most attractive cichlids of Lake Tanganyika are *Tropheus moorii* and *T. duboisi*. They attain a length of 5 to 6 inches (12–15 cm). *T. moorii* occurs in a wide variety of site and color variants.

✔ Similar, but not as splendidly colored, are *Simochromis* and *Pseudosimochromis*.

✔ Specialists might venture to keep the larger-growing, intensely aggressive cichlids of the genus *Petrochromis*.

**Aquarium conditions:** To correspond with the natural habitat in Lake Tanganyika, the aquarium should have a relatively large sandy area in the foreground and rock structures (see page 36) in the background.

**Diet:** Food for algae grazers must be rich in fiber. High-nutrient aquarium foods should not be given in more than minute amounts. The best staple food is dried food with a high content of plant materials. Frozen mysids and large brine shrimp may be given as a supplement (see page 43).



***Juvenile* Tropheus duboisi *are a striking solid black with white spots; adults feature a single vertical band.***

**Breeding:** All algae grazers practice maternal mouthbrooding. The females must not be removed from the main aquarium for too long or else they will be vigorously attacked by others of their species upon their return. The number of eggs in a spawn usually ranges from 2 to 20.

## Bottom-dwellers

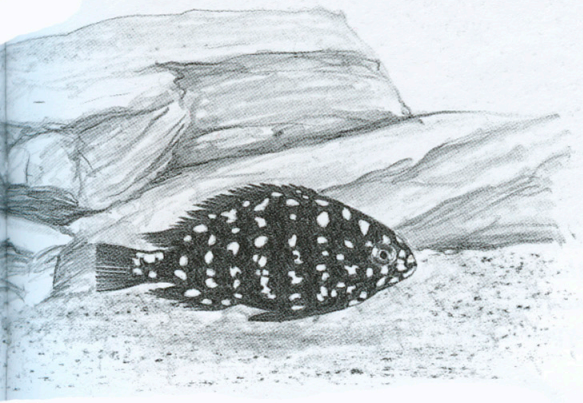
These cichlids *(Eretmodus cyanostictus)*, sometimes called "Tanganyika clowns" because of their jerky swimming style, have specialized in life at the bottom of the lake. Because their air bladder grew smaller in the course of this evolution, they look awkward when they swim in open water.

**Aquarium conditions and diet:** Similar to the requirements for algae grazers (see previous page).

**Breeding:** Form pairs, practice mouthbrooding, and take turns incubating the eggs.

## Cyphotilapia frontosa

With their imposing domed foreheads (see page 24) and two color variants, which differ in the number of vertical bands, these cichlids are in a class by themselves.



TIP

### Healthy Fish

✔ Purchase cichlids only from a reliable source (see TIP, page 15). If possible, ask an experienced aquarium enthusiast to go with you and help you evaluate the quality of the fish.
✔ Healthy cichlids are well nourished, but not plump bellied. They like to swim, and they eat eagerly.
✔ Do not purchase fish with damaged skin or fins, or with deformed head, backbone, or fins.
✔ Tanganyikan cichlids whose feces trail slimy filaments that don't break off are probably infested with intestinal parasites.
✔ Do not accept fish from a community aquarium where other fish are sick.

**Aquarium conditions:** Even though they are not particularly active swimmers, their size alone requires an aquarium that is at least 52 inches (130 cm) long. Use rocks to build a structure (see page 36) with hiding places large enough for the female but not for the somewhat larger male.

**Diet:** *C. frontosa* grow to as much as 14 inches (35 cm) long and need high-protein food, such as shrimp or mollusks. They will also adapt to eating feed pellets. Because they are relatively peaceful, they present almost no serious danger to smaller aquarium dwellers during the day; however, they do not fare well in competition with greedy and fast-eating cichlids. Feed them separately.

# GALLERY: MOUTHBROODERS

For many mouthbrooders, the male and female look very similar. In only a few mouthbrooding species is the male definitely more brightly colored than the female.

*Above: Female* **Cyphotilapia frontosa,** *one of the largest Lake Tanganyikan cichlids.*

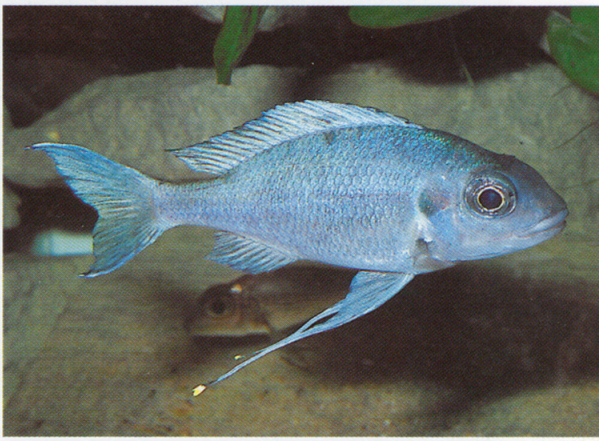
*Above: Males of the species* **Paracyprichromis nigripinnis,** *"Blue Neon," show to best advantage when the aquarium lighting is not too bright.*

*Above:* **Cyprichromis leptosoma,** *one of the many splendid color variants of the genus* **Cyprichromini.**

*Below:* **Tropheus moorii** *comes in many variants, the most sought-after of which is this "Red Rainbow."*

*Above:* **Callochromis pleurospilus** *are robust and spirited sand-dwelling cichlids.*

*Below:* **Ophtalmotilapia ventralis** *and some related species have elongated fin extensions with an egg spot on the tip.*



*Above: The vertical band on* **Tropheus duboisi** *may be white or yellowish (as in the "Moswa" variant).*

*Above: The brilliant colors of* **Enantiopus melanogenys** *show best when the fins are spread in courtship or dominance displays.*

*Left:* **Xenotilapia flavipinnis** *is one of the more highly sensitive sand-dwelling cichlids.*

## Cyphotilapia frontosa (cont'd.)

**Breeding:** *C. frontosa* reproduce relatively easily in the aquarium after the age of 2 or 3 years, and they are frequently bred. They do not form pairs. The females carry 10 to 30 eggs, and later the embryos, in their mouth for up to 45 days. Even free-swimming juveniles are offered protection for a time.

## Featherfins

The mouthbrooding cichlids of the genera *Ophtalmotilapia, Cunningtonia, Cyathopharynx,* and *Aulonocranus* are grouped together by virtue of their elongated ventral fins. They inhabit the transition zones between sand and rocks. The males grow to about 6 inches (15 cm) long; only the *Aulocranus* males remain somewhat smaller and less vividly hued.

**Aquarium conditions:** An aquarium for these cichlids should be especially large—5 feet (150 cm) or more—because the fish are lively swimmers and claim extensive territories. Cover as much as possible of the rear wall of the tank with rock structures (see page 36), and lay down a sandy substrate that is at least 3 inches (8 cm) thick.

**Diet:** In the wild, these species feed primarily on algae. In the aquarium, dry food with a high content of plant material (see page 42), supplemented with frozen brine shrimp, is ideal. Give high-protein food only in small portions.

**Breeding:** All the cichlids in this group practice maternal mouthbrooding and do not form pairs. They can be bred successfully in captivity only under optimal conditions. The females lay their 10 to 60 eggs in shallow nests dug by the male in the substrate or on a layer of sand he carries to a rocky outcropping. The obvious spots on the tips of the male's elongated ventral fins are decoy "eggs" that the females snap at; as they do so, the eggs in their mouths are fertilized.

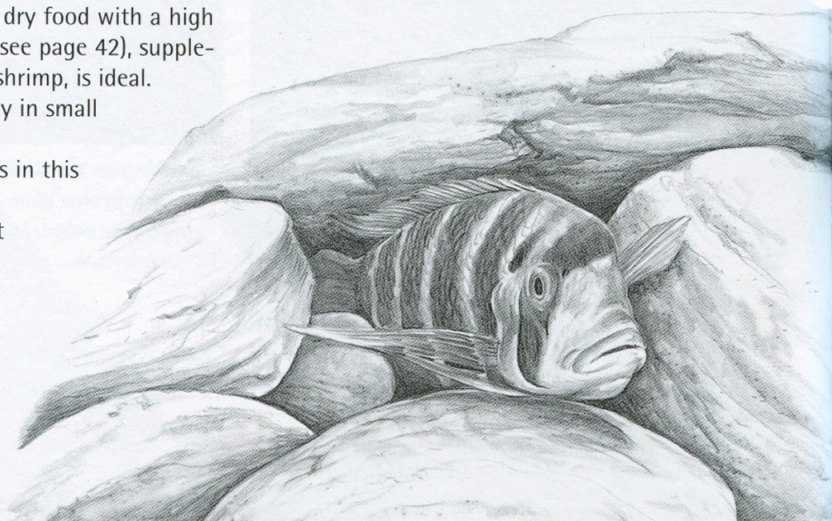
## Sand-dwelling Species

The sand-dwelling cichlids comprise two clearly distinguishable groups.

✔ The *Xenotilapia* and *Enantiopus* species are primarily subdued in color and delicate in appearance. Their adult length ranges from 3 inches (8 cm) *(X. flavipinnis)* to 6 inches (16 cm) *(X. sima),* and they live in groups. Because they are sensitive and mild-mannered, they should not be kept with aggressive species.

✔ In contrast, the *Callochromis* species, with their many site variants, are more strikingly colored and also often aggressive.

*C. macrops* and *C. melanostigma* (both grow to 6 inches, 15 cm), and *C. pleurospilus* (4.3 inches, 11 cm) are quite aggressive, particularly the males.



***Female* Cyphotilapia frontosa, *her mouth bulging with eggs or developing embryos.***

## Mouthbrooders from Lake Tanganyika

| Scientific Name | Size Male/ Female | Ratio* of Males to Females | Aquarium Size** | Preferred Shelter or Spawning Site | Species Requiring Similar Care (photo on page) |
|---|---|---|---|---|---|
| *Cyphotilapia frontosa* Photo, page 24 | 14 inches/ 10 inches (35 cm/ 25 cm) | 1 m/3 f (1 m/4–6 f) | 52 inches (130 cm) | rocks | |
| *Tropheus moorii* Photos, pages 24 and 29 | 5 inches (12 cm) | 1 m/3 f (1 m/4–6 f) | 48 inches (120 cm) | rocks | Color and site variants |
| *Tropheus duboisi* "Maswa" Photos, pages 1 and 25 | 5 inches (12 cm) | 1 m/3 f (1 m/1 f) | 48 inches (120 cm) | rocks | *T. brichardi* and *polli; Simochromis; Petrochromis* |
| *Eretmodus cyanostictus* Photo, page 44 | 4 inches (10 cm) | 1 m/1 f | 40 inches (100 cm) | rocks | *Tanganicodus irsacae; Spathodus erythrodon* |
| *Cyprichromis leptosoma* Photo, page 24 | 5 inches (12 cm) | 1 m/3–6 f | 32 inches (80 cm) | open water | *C. microlepidotus; Paracyprichromis nigripinnis* (24) |
| *Callochromis pleurospilus* Photo, page 25 | 5.5 inches (14 cm) | 1 m/3 f (1 m/4–6 f) | 40 inches (100 cm) | sand and rocks | *C. macrops* and *melanostigma* |
| *Xenotilapia flavipinnis* Photo, page 25 | 4 inches (10 cm) | 1 m/1 f | 40 inches (100 cm) | sand | *X. spilopterus, boulengeri,* and *papilio* |
| *Enantiopus melanogenys* Photo, page 25 | 6 inches (15 cm) | 1 m/3 f (1 m/4–6 f) | 40 inches (100 cm) | sand | *X. ochrogenys* "Ndole" and *X. sima* (56) |
| *Ophtalmotilapia ventralis* Photo, page 25 | 6 inches (15 cm) | 1 m/3 f (1 m/4–6 f) | 48 inches (120 cm) | sand and rocks | *Ophtalmotilapia; Cyathopharynx furcifer* |

* Sex ratio: optimum and (maximum)
** Minimum aquarium size for one species

***Female* Cyphotilapia frontosa *takes her young into her mouth for protection when danger threatens.***

✔ The only exceptions to this grouping of sand-dwelling cichlids are certain *Xenotilapia* species (such as *X. spilopterus*) and *Asprotilapia leptura*, which prefer a rocky habitat.

**Aquarium conditions:** When setting up the aquarium, provide a large open sandy area. Individual rocks scattered about the area help the fish mark their territorial boundaries. A rock structure against the back wall is needed only for the species that prefer a rocky habitat.

**Diet:** Sand-dwelling cichlids eat tiny marine animals. In the aquarium, they will accept dried, frozen, or live food.

**Breeding:** The breeding behavior of sand-dwelling cichlids varies widely.

✔ *Enantiopus melanogenys* and some *Xenotilapia* species such as *X. ochrogenys* practice maternal mouthbrooding and do not form pairs. The much brighter-hued males dig a shallow nest in the sand. *X. ochrogenys* "Ndole" even builds little hills around this nest (see page 50).

✔ *X. flavipinnis, X. spilopterus, X. papilio,* and *X. boulengeri* form more permanent pairs. The female broods the eggs for the first half of the incubation period and then passes the embryos to the male.

✔ *Callochromis* species also practice maternal mouthbrooding and do not form pairs. One male should always be kept with several females, in an aquarium that is at least 5 feet (150 cm) long and offers several distinguishable territories and hiding places. At spawning time, the male will dig one or more sandy pits about 4 inches (10 cm) in diameter.

## The Genus Cyprichromini

The species of the genera *Cyprichromis* and *Paracyprichromis* are exceptional in many respects. In Lake Tanganyika, they swim in open water, commonly forming schools of several thousand. Another unusual feature is that such schools may include different species. The fishes' bodies are slender and graceful, resembling those of carp. The males are much more brilliantly colored than the females.

**Aquarium conditions:** As pelagic (open-water) species, these cichlids get along especially well with peaceful cichlids that prefer sandy or rocky regions. The tank should not be less than 4 feet (120 cm) in length. Maintain a group of at least 5 to 7 of these shoaling fish. Because these species are generally more sensitive than most other Lake Tanganyikan cichlids, regular water changes are particularly important.

**Diet:** These cichlids feed on plankton in the wild. In the aquarium, they will eat water fleas *(Daphnia* and *Cyclops)* and live baby brine shrimp (see page 44), but also frozen brine shrimp and supplementary dried food. Feed them on an especially regular schedule and only with high-quality food.

**Breeding:** Successful breeding in captivity is possible only if these cichlids are maintained in relatively large groups, with optimal water and feeding conditions, and are not harassed by aggressive neighbors in the aquarium. *Cyprichromis leptosoma* and *C. microlepidotus* spawn in open water; *Paracyprichromis brieni, P. nigripinnis,* and *C. pavo* seek a substrate, such as upright flat rocks. All species lay only about 5 to 20 eggs. After about four weeks, the females release the fry in a particularly sheltered spot. If the female is under stress, she will retain the young in her mouth for a longer period; this harms both mother and offspring.

***These* Tropheus moorii *show the color markings that were first known in the aquarium trade.***

# Selecting Compatible Species

Lake Tanganyikan cichlids are best kept in company with others of their kind. An attempt to combine them with other cichlids, for example from Lake Malawi or in a standard community aquarium, often leads to problems and is not recommended.

As a rule, you should combine substrate spawners and mouthbrooders. Even if you lean more toward one group, the other should at least be represented. Choose your cichlids so that each habitat in the aquarium—the sandy areas, the rock structures, and the open water—is occupied by a pair or a group (in a larger aquarium, several pairs or groups). Keep in mind that combining certain species can require extra care at feeding time (see page 45) and that if species are quite similar, there is a risk of unwanted crossbreeding.

The size of the tank is a critical factor in determining your options in choosing compatible species.

✔ In a small tank—40 inches (100 cm) in length—you can stock a group of mouthbrooders (1 male/2–3 females) along with two different pairs of smaller substrate spawners.

✔ If the aquarium is 5 feet (150 cm) long, however, you can choose between a much larger number of individual fish of the same species (for example: mouthbrooders, 2 males/6–10 females; substrate spawners, 2–3 pairs of each) or a greater variety of species (perhaps 2 groups of mouthbrooders, each with 1 male and 2–3 females, plus 3–4 pairs of substrate spawners).

✔ If you have an even larger aquarium, of course, you can add to these numbers even further.

## Sample Cichlid Communities

The following examples should give you ideas about how to stock community aquariums of different sizes.

**Smaller aquarium (40–48 inches, 100–120 cm):**

✔ Mouthbrooders: 1 group (1 male/3–4 females) of *Xenotilapia* or *Callochromis pleurospilus* or *Tropheus* or *Ophtalmotilapia*; also, 1 group (1 male/5 females) of *Cyprichromis* or *Paracyprichromis*.

✔ Substrate spawners: 1 pair of *Julidochromis* or *Chalinochromis* or *Telmatochromis*; also, 1 pair of *Neolamprologus* or shell dwellers (the latter only with *Tropheus* or *Ophtalmotilapia*).

**Medium-sized aquarium (4–5 feet, 120–150 cm):**

✔ Mouthbrooders: 1 group (1 male/5–8 females) of *Xenotilapia* or *Callochromis* or *Tropheus* or *Ophtalmotilapia*, or 1 group (1 male/3 females) of *Cyphotilapia frontosa*; also, 1 pair of bottom-dwellers *(Eretmodus cyanostictus)* and 1 group (up to 3 males/8 females) of *Cyprichromis* or *Paracyprichromis*.

✔ Substrate spawners: 1 pair of *Julidochromis* and 1 pair of *Neolamprologus*, plus 1 pair of shell dwellers.

**Large aquarium (more than 5 feet, 150 cm):**

✔ Mouthbrooders: 1 group (1 male/5–8 females) each of *Xenotilapia* (or *Callochromis), Tropheus*, and *Ophtalmotilapia*; possibly also 1 group (1/3) of *Cyphotilapia frontosa*; also, 1 pair of bottom-dwellers *(Eretmodus cyanostictus)* and 1 group (up to 3 males/8 females) of *Cyprichromis* or *Paracyprichromis*.

✔ Substrate spawners: Several pairs from the species *Julidochromis, Chalinochromis, Telmatochromis*, and *Neolamprologus*, plus 1 pair of shell dwellers.

All of these numbers refer to adult fish in a Lake Tanganyikan aquarium. If you begin with juveniles, initially you should allow two additional fish per species.

# 10 Golden Rules
## for Selecting Compatible Species

1. An aquarium less than 40 inches (1 m) long should contain only a single species (often only a single pair).
2. Combine only species with different habitat requirements, so that they will prefer to stay in different parts of the aquarium.
3. Mouthbrooders and substrate spawners can share the same aquarium, because they prefer different spawning sites.
4. Set up the aquarium so that each species has at least one suitable hiding place and spawning site. Often these are the same area.
5. Don't ask delicate or peaceful species to live with fish that are very lively or aggressive.
6. Small fish won't survive in the same aquarium with large predators.
7. Never combine closely related species, or site or color variants of the same species.
8. The species that share an aquarium should be able to thrive on the same kinds of food.
9. Bottom-dwellers (see page 23), shell dwellers (see page 14), and the carp-like Cyprichromis or Paracyprichromis (see page 29) are a good addition to almost any Lake Tanganyikan aquarium.
10. Be watchful when you try new combinations; separate fish that don't get along well.

# THE AQUARIUM DAY BY DAY

***With a Lake Tanganyika aquarium, you can bring a fascinating piece of Africa's underwater environment right into your home. In this chapter, you'll find more information about how to give your cichlids living conditions like those in their natural habitat.***

## The Right Aquarium for Your Fish

**Tank:** Modern glass aquariums are made of plate glass held together with a silicone adhesive; most manufacturers guarantee them against leakage for up to three years. A community of Lake Tanganyikan cichlids needs a tank at least 40 × 20 × 20 inches (100 × 50 × 50 cm) to be able to behave naturally. Because the necessary rock structures are heavy, it is advisable to choose glass that is at least 0.3 inches (8 mm) thick—0.4 inches (10 mm) thick if the tank length is 4 feet (120 cm) or more. Smaller aquariums—from 2 feet (60 cm) long—may be used for Lake Tanganyikan cichlids only as a breeding aquarium for a single pair (see page 58) or as accommodations for shell-dwelling species (see page 14). In general, the larger your aquarium, the easier it will be to take care of your fish and the more you will enjoy them.

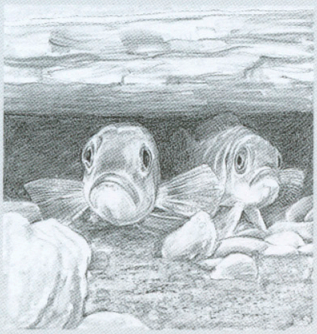
**Location:** Even a relatively small Lake Tanganyika aquarium, with dimensions 40 × 20 × 20 inches (100 × 50 × 50 cm), weighs about 550 pounds (250 kg). The aquarium stand and the floor beneath it must therefore be extraordinarily stable. Place the aquarium close to appropriate power outlets and a water source.

**Safety measures:** Because electricity and water is a dangerous combination, the electrical appliances needed for an aquarium are subject to special safety requirements (see *HOW-TO: Set Up the Aquarium*, page 34). When buying electrical equipment, look for the UL mark that indicates the item complies with the safety standards established by the Underwriters Laboratories, Inc. and carefully follow the manufacturer's instructions. The use of an electronic circuit breaker that will interrupt the flow of electricity if there is damage to appliances or wiring is strongly recommended. Always unplug all electrical systems when working in the aquarium.

**Insurance:** The water damage from an overflowing or leaky aquarium can be quite costly. Therefore, before purchasing your aquarium, have it included in your homeowner's or renter's insurance and find out what the coverage includes.

**Neolamprologus longior** ***(above left) and the shell-dwelling*** **Lamprologus ocellatus** ***(below left) are usually compatible neighbors.***

# HOW-TO: SET UP THE



*Shallow cavities provide refuge and spawning sites for smaller* **Neolamprologus** *species and slender-bodied species.*

### Setting Up the Aquarium

✔ Place the tank on a foam pad slightly larger than the base and at least ½ inch (1 cm) thick.

*A Lake Tanganyika aquarium should simulate a natural environment for the cichlids it shelters.*

✔ Purchase a decorative prefabricated panel for the inner rear wall, or attach a dark background panel to the outside of the tank.

✔ Arrange the rocks for the rock structure (see page 36) securely on a Styrofoam pad on the glass bottom.

✔ Rinse fine sand in a bucket until the water remains clear. Then "inoculate" the sand with a few handfuls of substrate from an established aquarium and place it in the tank, forming a layer 2 inches (5 cm) deep in the foreground and gradually increasing to 4 inches (10 cm) deep in the rear of the tank.

✔ Install a water heater in a rear corner of the aquarium or as part of an internal filter unit.

✔ Insert a motorized internal filter, or fill the installed internal filter with filter material and attach the filter pumps in the clear water chamber. "Inoculate" the filter with filter material from an established aquarium.

*Rock structures are essential to a Lake Tanganyika aquarium.*

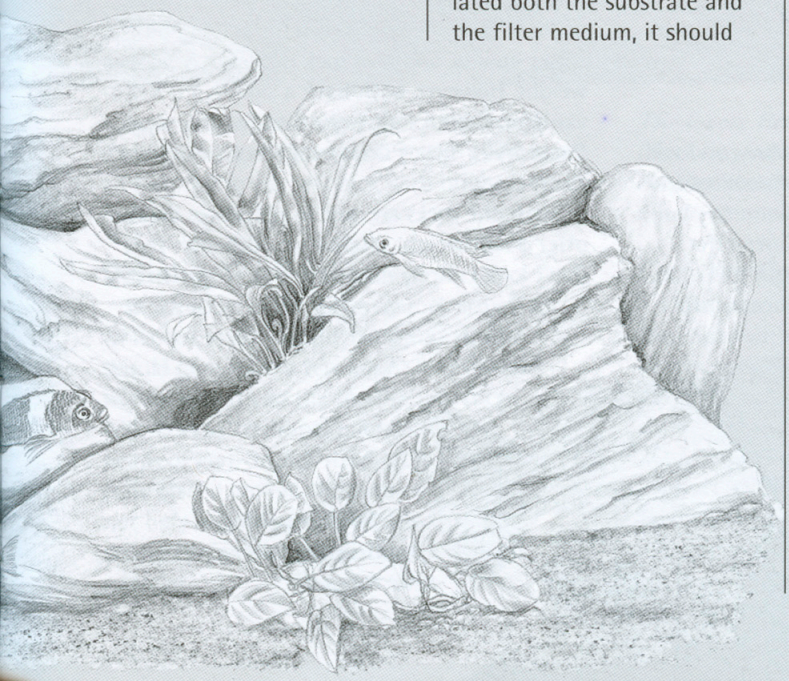
**Adding Plants**

Although a Lake Tanganyika aquarium does not need plants, they create an attractive contrast to the rock structures and can serve as visual screens and territory markers. However, plants will thrive only if the aquarium is limited to substrate spawners. Rooting plants, such as Java fern or *Anubias barteri*, should be tied with fishing line or cotton twine to rocks, where they will take root. Both these species tolerate the hard water and alkaline conditions in a Lake Tanganyika aquarium.

✔ Add water until the tank is half full.
✔ Arrange any plants; then carefully add the remaining water.
✔ Turn on the electrical equipment, following the manufacturer's instructions (see page 33). The lighting should be controlled with a timer to provide approximately 10 to 12 hours of light daily.

**Stock the Fish**

If you have properly inoculated both the substrate and the filter medium, it should be possible to introduce your fish about five days after setting up the aquarium.
✔ Turn off the aquarium lighting. Then place the sealed plastic bags, with the fish inside, in the aquarium water to adjust to the proper temperature.
✔ After about 15 minutes, open the bags and mix the water in the bags with an equal amount of aquarium water.
✔ After another 15 minutes, release the fish into their new environment.



**Routine Care**

✔ Change the water at regular intervals (see page 39).
✔ Rinse the pre-filter once a week. The actual filter medium also must be cleaned regularly, but less often (see page 39).
✔ Suction off scum from the aquarium floor and from the clear water chamber.

# Creating a Suitable Environment

The task of decorating an aquarium for Lake Tanganyikan cichlids primarily involves building rock structures in a way that simulates the natural environment.

## Aquarium Type

An aquarium for Lake Tanganyikan cichlids should always include both rock structures and an open sandy area. Beyond that, however, the basic character of the aquarium can vary widely, depending on how many rocks you use and how you place them. For sand-dwelling species (see page 26) or shell dwellers (see page 14), the sandy zone should be very large, with only a few rocks arranged in the background as decoration. Other substrate spawners and mouthbrooders, by contrast, need significantly more and higher rock structures, which should be spread about the aquarium to provide the shelters, spawning caves, and territory markers these species require.

## Building Rock Structures

Because rocks and stones are heavy, you will probably have to make some compromises as you set up a Lake Tanganyika aquarium. Although tall, complicated structures offer plenty of hiding places and look quite attractive, they also place a significant load on the aquarium's glass bottom. If you must have a rock-heavy aquarium layout, it would be wise to use a custom-built tank with a reinforced bottom.

*Flat rocks* made of slate are particularly useful for assembling complex structures for species that spawn in caves. Pile them in alternating layers, leaving wide shallow cavities in between. Use flat stones of other types to provide crevices that are somewhat higher and more open.

**General rules:** Stones with flat tops and bottoms are easier to layer than rounded stones. For tall structures, use broken rectangular pieces of rock and pile them carefully, using the rear wall as extra support. Always consider the amount of weight you are asking the aquarium to hold. Particularly large flat rocks can also be set upright, leaning against the rear or side walls.

*Porous limestone and lava rock* have a rough surface which makes them less likely to slip out of place. Also, limestone can promote good water quality, and lava rock is relatively light in weight. However, both have a significant disadvantage: Their rough, jagged edges may injure the cichlids if they accidentally scrape against the rocks.

*Synthetic rocks* are sold in pet stores and offer a lightweight alternative, although they don't look entirely natural.

***A* Neolamprologus boulengeri *hovers near its shell.***

***The lovely Princess of Burundi* (Neolamprologus brichardi) *and the checkerboard-marked Julidochromis marlieri.***

**Note:** Many kinds of rock include bits of metal that can be toxic to fish. For this reason, be sure not to use any rock with bright metallic flecks.

## Defining Territories

In addition to the piled-up rock structures, which are mostly in the background, you should also place a few large stones in the middle region and the foreground. These will serve as territorial markers. Rubble heaps of egg- to fist-sized rocks, strategically placed around the sandy area, will not only look attractive but also provide young fish a refuge from their predatory relatives.

## Creating Caves

Offer your substrate-spawning cichlids rock structures with plenty of crevices of different shapes and sizes. If the fish can choose the cave that suits them best, they will feel more secure and will be more willing to reproduce. Many smaller cichlid species prefer to dig hollows under flat stones placed directly on the sand. For shell-dwelling species, simply place a generous number of snail shells in the sandy region.

# Water Quality and Maintenance

The temperature and chemistry of the water in Lake Tanganyika are very stable, varying only slightly from season to season and from one part of the lake to another. Also, it's quite possible that the tap water in your home already has the right pH value and hardness for Lake Tanganyikan cichlids. As a result, the cost of maintaining the water in your aquarium may be quite reasonable.

## Temperature

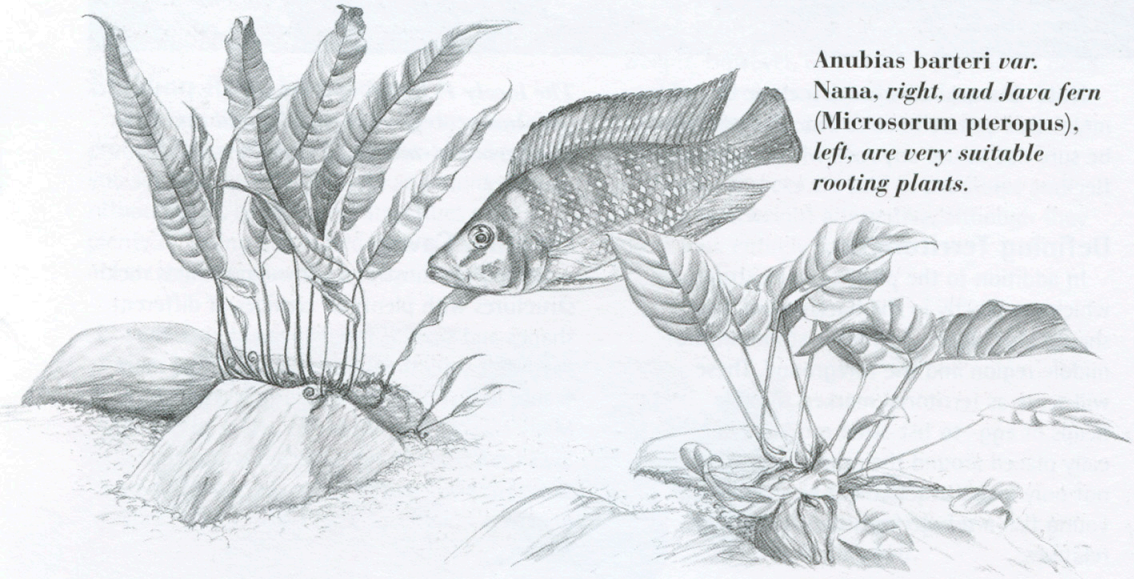
The water temperature in Lake Tanganyika ranges from 75 to 80°F (24 to 27°C). To simulate natural conditions for the cichlids in your aquarium, keep the temperature at about 79°F (26°C).

## pH Value

It's easy to determine the pH value of your aquarium water using the test kits sold in pet stores. Above pH 7, the water is alkaline; below pH 7, it is acidic. Unlike most lakes, Lake Tanganyika is quite alkaline, with pH values of 8 or more. Never let the pH of the water in your aquarium drop below 7.5. Peat-based filter media, resinous pinewood from bogs, and carbon dioxide in fertilizers acidify the water and should not be used in a Lake Tanganyikan aquarium.

## Water Hardness

Another important parameter of water quality is hardness—the amount of calcium and salts in the water. Water hardness is described in terms of German carbonate hardness (°dKH) and German combined hardness (°dGH), or in parts per million (ppm) of calcium



**Anubias barteri *var.* Nana, *right, and Java fern* (Microsorum pteropus), *left, are very suitable rooting plants.***

and magnesium carbonates and non-carbonates dissolved in the water. Pet stores sell kits for testing water hardness. Lake Tanganyika water ranges from 10 to 12°dKH and 15 to 18°dGH, and thus is moderately hard to quite hard. Although softer water (below 8°dGH or 8°dKH) is not suitable for maintaining Lake Tanganyikan cichlids, harder water will not harm the fish.

*Soft water* must be buffered. You can increase the water hardness gradually by using limestone rocks for decoration, or more quickly by replacing part of the filter medium with crushed coral, which is sold in pet stores.

## Filters

Several types of filters might be used in a Lake Tanganyikan aquarium, depending on its size.

✔ For small tanks (up to 26 gallons, about 100 L), an internal sponge filter operated with a diaphragm pump will suffice; an alternative is a small motor-driven internal filter.

✔ For aquariums up to 40 inches (100 cm) long and containing up to 66 gallons (250 L), choose a large internal motor-driven filter.

✔ For even larger tanks, the best solution is a built-in filter consisting of a series of chambers attached to one or two sides of the aquarium (specify when you purchase the aquarium). The water flows into the filter at one opening, then through glass tubes from one chamber to the next. The chambers may contain different filter media. At the end of the filter system, a circulating pump sends the water back into the aquarium, creating a strong current. A built-in filter is easy to maintain, especially if it is of adequate size. It should occupy about one tenth of the total aquarium volume; then it will only need to be cleaned every few months.

TIP

### Changing the Water

Changing the water is the most important task in the routine maintenance of your Lake Tanganyikan aquarium.

✔ Depending on the number of fish, you should replace one fourth to one half of the water every one to two weeks.

✔ When you change the water, do not allow the water temperature to drop more than briefly or by more than about 37°F.

✔ It's best to bring the water to the correct temperature in a separate water heater and then let it flow through a tube into the aquarium. Attach an aerator (sold in pet stores) to the end of the tube to drive out any chlorine gas, and direct the flow of water against the rockwork to avoid disturbing the sandy substrate.

✔ You can also simply mix cold and hot water in a bucket until the temperature is right.

✔ If you have just cleaned most of the filter medium, you should wait at least a day before changing the water.

**Filter media** vary; the most suitable is porous blue foam, sold in pet stores, because it is especially easy to clean. Other options include coarse synthetic filter pads, clay tubes, "bio-balls," or crushed lava. In addition to the filter medium itself, you should also use filter pads or sponges as a pre-filter that can be rinsed about once a week.

**Note:** Avoid using plastic materials that are not food quality; they may harm your cichlids' health.

## Plants in the Aquarium

"Plant-friendly" water has a pH somewhere between 6.5 and 7.5. It is soft to at most moderately hard. However, Lake Tanganyikan cichlids need at least moderately hard water, and the pH must be above 7.5. This alone means that lush underwater greenery will hardly ever thrive in a Lake Tanganyikan aquarium. Another factor to consider is the not exactly plant-friendly behavior of some mouthbrooding cichlids:

✔ The sizeable *Cyphotilapia frontosa* (see page 23) will devour any plant within reach.

✔ With algae grazers (see page 22) and featherfins (see page 26) in the tank, plants have about a 50:50 chance of survival.

***Shell-dwelling cichlids* (Neolamprologus brevis) *dart among plants that were tied to rocks, where they took root.***

✔ Sand-dwellers (see page 26) and *Cyprichromini* (see page 29) usually leave plants undisturbed, but they need ample space to swim about; therefore, any luxuriant foliage should be kept in the background.

✔ Substrate spawners are generally not a threat to plants but will dig them up.

### Suitable Plants

Plants have a chance in a Lake Tanganyikan aquarium only if the pH is not above 8, and the combined hardness is not above 15°dGH.

They must tolerate hard, alkaline water and thrive without carbon dioxide fertilizers. It's also an advantage if they have relatively tough leaves. Only a few species of plants meet these requirements.

**Low rooting plants** (see page 35) include the following choices:

✔ Java fern *(Microsorum pteropus)*; the standard form has undivided leaves, and there are two cultivated varieties: "Tropica" (broadly pinnate) and "Windelow" (finely pinnate).

✔ Small *Anubias* species *(Anubias barteri* var. *Nana)*, though it grows only poorly without carbon dioxide fertilizer.

✔ Java moss *(Vesicularia dubyana)*.

**Background plantings** are effective with species that grow tall, eventually spreading out at the surface:

✔ American eel grass *(Valisneria americana)*.

✔ Common eel grass *(Valisneria spiralis)*.

✔ Giant eel grass *(Valisneria gigantea)*.

✔ Onion grass *(Crinum thaianum)*.

✔ Varieties of hornwort *(Ceratophyllum* sp.); these may be anchored under a stone or used as floating plants.

✔ Indian fern *(Ceratopteris thalictroides)* and *Ceratopteris cornuta* also do well as rooted plants or as floating plants.

✔ A few Amazon species will also tolerate the conditions in a Lake Tanganyikan aquarium; an example is the Amazon sword plant *Echinodorus cordifolius*, which has heart-shaped leaves.

Plants that need a substrate for rooting may also be planted in a separate pot with coarse gravel (and a small amount of clay, which is rich in nutrients, as fertilizer). It's easy to hide the pots behind or between rock structures.

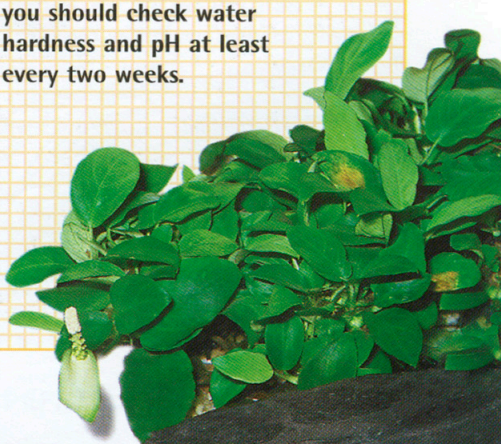
## Checklist
### Plant Care

**1** **A Lake Tanganyikan aquarium that contains plants needs a longer period of light than one without plants—about 12 to 14 hours a day.**

**2** **Changing the water at regular intervals (see page 39) not only keeps your fish healthy, but also provides plants with important nutrients that are scarce in a Lake Tanganyikan aquarium.**

**3** **Watch to see whether your cichlids eat a particular plant, bite off bits of it, or dig around its roots. If so, try moving the plant to another part of the aquarium; if that doesn't help, you should remove it from the tank.**

**4** **Luxuriant plant growth can cause the water to become softer and more acidic. If your aquarium contains abundant plantings, you should check water hardness and pH at least every two weeks.**



# The Right Diet

The cichlids of Lake Tanganyika differ in their feeding requirements, in part because they vary so much in size. In addition, many species have adapted to specific food sources. However, none of this specialization is so extreme that you will be unable to feed your fish with ordinary commercial fish food.

## Dried Food

Dried food comes in a great variety of shapes and sizes, from the finest powder to chunks about ½ inch (1 cm) in diameter. The most common types are flakes, tablets, and granules. Also available are feed sticks and pressed pellets made especially for cichlids. Be aware, however, that dried foods can vary widely in content. There are foods that are especially high in protein for juveniles, "green" foods with a high fiber content for herbivores, and carotene-rich foods to enhance the red pigment in certain colorful species. Good-quality dried food is an excellent dietary staple for Lake Tanganyikan cichlids. Always be sure to check the expiration date, because vitamins have a limited shelf life.

## Live Food

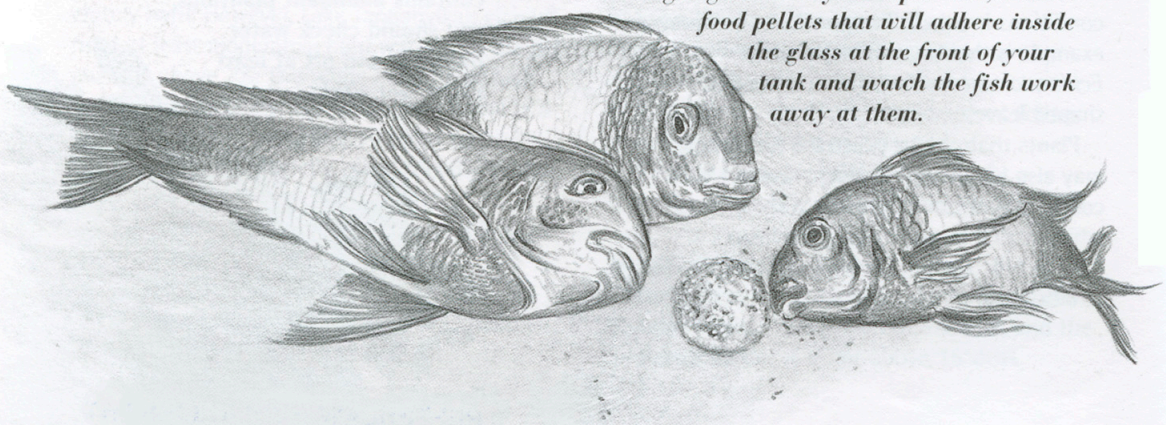
For reasons of convenience, lack of suitable lakes or streams, legal issues, and the risk of introducing disease, many aquarium hobbyists choose not to collect their own fish food. Various types of live food are available in pet stores.

**Small crustaceans:** Water fleas *(Daphnia* and *Cyclops)* are taken with relish and can contribute to the bright coloring of many cichlids.

**Black and white mosquito larvae:** Black mosquito larvae should always be frozen; otherwise, you risk introducing a swarm of biting pests into your home. These are an especially nutritious food for your fish, improving their readiness for spawning. Equally beneficial are white mosquito larvae, which are sometimes also sold live. These mosquito species do not bite.

**Worms and insects:** Earthworms live in your garden year-round, and fly larvae or mealworms (the larvae of darkling beetles) are sold in most pet stores. They are a good addition to the diet of large non-herbivorous cichlid species.

*To observe the natural feeding behavior of algae grazers in your aquarium, choose food pellets that will adhere inside the glass at the front of your tank and watch the fish work away at them.*



**Foods that are not recommended:** Red mosquito larvae and tubifex worms are often collected from the mud of dirty water and can be very harmful to your cichlids' health.

## Frozen Food

Many live foods are available almost exclusively in frozen form. Of these, brine shrimp *(Artemia salina)* and opossum shrimp *(Mysis)* are favorites of most Lake Tanganyikan cichlids. Fish filets, mussel meat, and shrimp meat are also good choices.

## Food for Algae Grazers

In Lake Tanganyika, species such as *Tropheus* or *Ophtalmotilapia* feed on the layer of algae that grows on rocks in shallow water. All sorts of minute organisms living within this layer are eaten along with the algae. In the aquarium, such specialized cichlids need a high-fiber food, rich in green vegetable matter. Their needs are best met with special high-quality dried food containing *Spirulina* algae. It doesn't really matter whether you choose flakes, granules, or tablets. If you're interested in observing the natural feeding behavior of algae grazers, occasionally choose food pellets that will adhere inside the glass at the front of your tank. The cichlids nibble at them with relish until they disappear. Also give frozen brine shrimp now and then to enrich the diet.

## Food for Smaller Substrate Spawners and Mouthbrooders

Substrate spawners up to about 6 inches (15 cm) long, as well as mouthbrooding species other than algae grazers, nourish themselves in their natural habitat primarily on small crustaceans, insect larvae, and worms. In the aquarium, they will accept any of the commercially available fish foods, as long as the pieces will

## VACATION CARE

*If your aquarium has been up and running without problems for some time, you will have no difficulty preparing it for a brief or extended absence.*

✔ *About five days before you leave, change one third to one half of the water.*

✔ *Three days before you leave, clean the pre-filter, quick filter, or internal filter.*

✔ *You can leave adult fish on their own without feeding them for up to one week, but juveniles must be fed daily.*

✔ *If you choose to use an automatic feeding device for a prolonged absence, start using it ahead of time so that you can determine how much to feed.*

✔ *If a person who is not used to keeping fish is tending your aquarium, divide the daily feed rations into small containers (film canisters are handy) marked with the date to feed them. Emphasize that no additional food should be given.*

✔ *Leave the telephone number of an experienced aquarium keeper or a pet shop that offers emergency service, in case serious problems arise.*

fit into their mouths. Baby brine shrimp (see below) are especially important. Most smaller substrate spawners devour these eagerly, and they enhance the brilliant colors of your aquarium guests.

## Food for Large Lake Tanganyikan Cichlids

The large cichlids of Lake Tanganyika, such as *Cyphotilapia frontosa* or the *Lepidolamprologus* species, hunt down and devour smaller fishes in the wild. They have hearty appetites but often can be very picky eaters. They are best fed frozen shrimp, fish filets, or mussel meat. You might also try chopped beef heart, earthworms, fly larvae, or fish food tablets, but the cichlids often take a long time getting used to these alternatives.

## Food for Young Cichlids

Newly free-swimming juveniles are fed primarily on live baby brine shrimp (see below). This may be supplemented with fine dry food specially formulated for young fish. If algae growth has developed on the rock structures in your aquarium, the fry will enjoy prowling through it for tiny prey.

**Live baby brine shrimp:** Tropical fish dealers sell brine shrimp eggs. You can easily hatch out a supply of excellent live food.

You can purchase a special container or use an empty 1-liter soda bottle for hatching the eggs.

✔ Fill the container two-thirds full with water. Add two teaspoons of plain table salt (without additives) or sea salt (sold for marine aquariums) and half a teaspoon of brine shrimp eggs.

✔ Place the bottle in a warm place (at least 68°F, 20°C). Aerate the water with a diaphragm pump and an air tube.

✔ After 24 to 36 hours, the baby brine shrimp will hatch. Now turn off the air pump and wait five minutes, until the baby brine shrimp have settled to the bottom of the container.

✔ With another piece of tubing attached to a large syringe, suction off the baby brine shrimp. Dispense the baby brine shrimp into the aquarium where the young fry are to be fed. The small amount of saltwater that accompanies them will not harm your Lake Tanganyikan cichlids.

✔ You can also harvest small quantities of baby brine shrimp by placing the saltwater in a shallow dish and scattering a few brine shrimp eggs on the surface. After a day or two in a

***Color variant of the bottom-dwelling cichlid* Eretmodus cyanostictus, *from the southern end of Lake Tanganyika.***

warm place, the eggs will hatch; collect the baby brine shrimp from the bottom of the dish with a syringe and tube and feed them to your juvenile cichlids.

## Proper Feeding

Your cichlids need the right quality and quantity of food if they are to remain healthy and breed successfully. Keep these guidelines in mind:

✔ Juveniles should be fed three or four times a day, adults only once.

✔ One day a week, let fully grown fish go without food.

✔ Be sure the diet includes as much variety as possible.

**Tropheus moorii** ***"Ikola" male (also known as the Kaiser Tropheus).***

✔ If your aquarium contains several species, you may have to feed them in separate locations to be sure the slower eaters get their fair share.

✔ Feeding is especially difficult if you maintain algae grazers along with other species. The other species might not get enough nourishment from high-fiber "green" food, whereas a more protein-rich diet might cause the algae grazers to become overweight or suffer intestinal disorders. The best compromise may be to feed a wide variety of high-quality dried food.

TIP

### Preventing Infections

✔ Purchase all the fish for your aquarium at the same time, if possible, and only from a reputable dealer or breeder.
✔ If you do purchase additional fish later, observe them in a quarantine aquarium for several weeks before placing them in the community aquarium.
✔ If you replace a large quantity of water (more than half the aquarium water), use a water conditioner.
✔ Add salt to the aquarium water. Use either special salt from a tropical fish dealer (following the instructions), sea salt for marine aquariums, or plain table salt with no iodine or fluoride added. Use ⅔ cup per 25 gallons (200 g per 100 L).
✔ Provide the best possible living conditions in your aquarium. This is the best and most lasting way to strengthen your cichlids' natural resistance to disease.

## Preventing Disease

Lake Tanganyikan cichlids are relatively hardy fish. If diseases do occur, the causes can be complex to identify and remedy.

### Signs of Illness

✔ Fish linger in hiding at the bottom of the tank.
✔ Fish hover right at the surface of the water or swim with wobbly movements.
✔ Their respiratory rate is visibly faster.
✔ Fish rub or chafe their belly or gills.
✔ Their fins lie flat against their sides.
✔ Isolated fish stay in a corner of the tank, just under the water's surface.
✔ Unmistakable symptoms of disease are cloudy eyes, goggle eyes, damaged or frayed fins, and an unnatural swelling of the belly.

### Possible Causes

**Improper care:** Diseases often occur only after aquarium conditions deteriorate. Check:
✔ Are filters, heating, and lighting in good order?
✔ Has the pH dropped below 7.5?
✔ When did you last change the water?
✔ Are the fish fighting with each other?

*Badly damaged fins (left) are often the result of fierce battles. A distended belly (right) indicates an intestinal disorder.*

Make every effort to restore ideal aquarium conditions as quickly as possible.

**Injuries:** Territorial battles among cichlids can lead to significant damage to the fins or mouth, and fleeing fish may injure themselves on rocks. Bullies must be removed from the aquarium. Often, however, an infection of the wounds presents more danger than the injury itself. Simply adding salt to the water (see TIP, page 46) can sometimes prevent infections.

**Infections:** Fungal diseases occur primarily at the site of wounds and look like tufts of cotton wool. Fish that are stressed are vulnerable to white spot disease, or "ich," a parasitic infection that appears as tiny white dots on body and fins. Both ailments can be cured with medications sold in pet stores.

The situation is quite different in the case of bacterial infections, which are manifested as open sores, body parts suffused with blood, or fin rot. Such infections are quite difficult to diagnose correctly. Broad-spectrum medications available from pet stores can have some effect if applied in time.

**Parasites:** Slimy, whitish feces, darkening of the fish's body, and gagging motions are generally signs of intestinal parasites. These can be treated with metronidazole (obtained from a veterinarian). Use 500 mg per 26 gallons (100 L) of aquarium water; after three days, replace one-third of the water and add activated carbon to the filter. Fish that breathe rapidly and chafe the gills probably have the worm infestation called gill flukes. This can be dangerous in juveniles and in cases of severe infestation. Medication is sold in pet stores.

*Iodine deficiency* is the likely culprit if fish have distinctly protruding gill covers but do not chafe or show other signs of illness. The remedy is to add a solution of iodine in aqueous potassium iodide (from the veterinarian). Use ¼ teaspoon per 16 gallons (1 ml per 50 L) of water; repeat each time the water is changed. Symptoms should subside after several weeks.

*Poisoning* should always be considered if fish show accelerated breathing, swim around in panic, swim with jerky motions, or appear apathetic. Possible causes include copper from new water pipes, chlorinated tap water, or an overdose of medication. It is essential to remove the cause of poisoning. As first aid, replace at least half the aquarium water (see page 39).

# BEHAVIOR PATTERNS AND BREEDING

***The fascination of Lake Tanganyikan cichlids lies not only in their luminous color markings, but also in their variety of behaviors. From the grace and vigor of mating rituals to the fierce tactics of territorial battles, these fish offer the aquarium enthusiast a wide range of enthralling entertainment.***

## Observing Your Cichlids

When you keep Lake Tanganyikan cichlids in your aquarium, you have the opportunity to follow them through all the important stages of life, from the hatching of young fry to the stormy combat between adults. As these fascinating creatures establish territorial boundaries or compete with other cichlids, as they form into groups and schools or bond as pairs to tend their offspring, you have a front-row seat at the show. Like other cichlids, the species of Lake Tanganyika send signals to those who share their environment, indicating—through their coloring and markings, but especially through their behavior—which species they belong to, whether they are male or female, and how they expect to interact. Sounds and odors also play a role in this communication, though you may not be aware of these. The visible behaviors of cichlids, however, provide important clues about how you can take even better care of your fish and encourage them to breed successfully.

**Neolamprologus tetracanthus,** ***a variant from the northern region of Lake Tanganyika.***

### Territorial Behavior

With few exceptions, Lake Tanganyikan cichlids prefer to stay close to the bottom or near rock formations along the shore. Almost all species claim a particular territory as their personal feeding grounds. This is the fundamental principle of their survival. This is where they hunt for prey or graze on the algae growth that coats the rocks. For breeding, they also stake out another, usually smaller, area, generally somewhere in the middle of their feeding grounds.

✔ For the mouthbrooding cichlids of Lake Tanganyika, this is a spawning territory into which the male seeks to entice receptive females. Depending on the species, it may be the flat upper surface of a boulder, a shallow trench formed in the sand, or a sandy crater.

✔ Substrate spawners, on the other hand, form pairs to occupy a cave or crevice of appropriate size, where they lay their eggs and tend the hatchlings until they are free swimming.

In all cases, these territories are fiercely defended, because any infringement threatens the cichlids' survival or their reproductive success. Only a few species of Lake Tanganyikan cichlids, such as the carp-like *Cyprichromis* and

*Paracyprichromis* species (see page 29), do not establish territories.

## Forming Pairs and Groups

Most cichlids of Lake Tanganyika lead a gregarious life, forming pairs, groups, or even schools. Their social behavior can be markedly different during and outside of the breeding period. Pair bonding is common among substrate spawners *(Neolamprologus, Telmatochromis,* and others), but rare among mouthbrooding species (the bottom-dwelling *Eretmodus cyanostictus* does form pairs; see page 23). The duration of the mating bond also varies from species to species. Among mouthbrooders, male and female often come together only to breed; the rest of the time, they join others of their species in a more or less large group. By contrast, substrate spawners engage in much more intense pair bonding. Many species (such as *Neolamprologus brichardi)* even form extended families that include the parents and several generations of juveniles. In other species, one male lives with a harem of several females and mates with each in succession. In Lake Tanganyika, such harems are seen among *Lamprologus callipterus*, a shell-dwelling species; in the aquarium, they also occur among *Julidochromis* and *Neolamprologus* species.

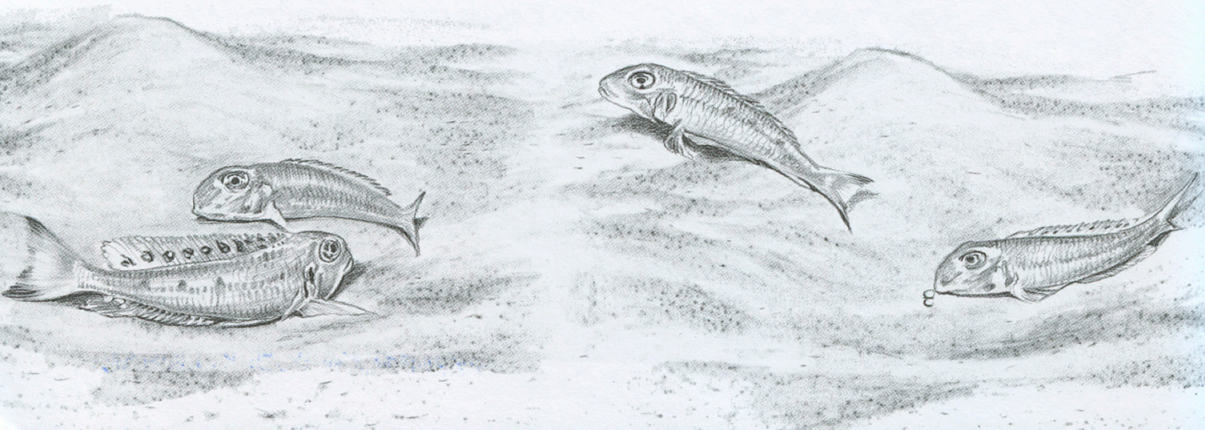
The relatively constricted conditions in an aquarium can intensify the natural bonds in certain species. The algae-grazing *Tropheus moorii*, for example, lives in loose groups in the wild. In the aquarium, group members form such close bonds that it becomes practically impossible to integrate additional cichlids into the group at a later time.

Only a few Lake Tanganyikan cichlids form actual schools. These include many sand-dwelling species (see page 26) and—in an extreme form—the pelagic species of the tribe *Cyprichromini* (see page 29).

## Battles

When cichlids fight, the reasons are almost always closely connected to territoriality and reproduction. Boundary disputes often occur where two territories meet or even overlap.

***Spawning pairs of* Xenotilapia ochrogenys *"Ndole." The male has constructed small cones of sand around the spawning nest.***



Two males of a mouthbrooding species frequently become rivals when they both are pursuing the same female for mating. Fights may also occur in a group as individuals jostle for dominance.

Serious and prolonged combat is rare, however, and most encounters involve only ritualized sparring. The subordinate fish can often appease the aggressor by assuming a submissive posture. To do this, the fish flattens its fins to appear as small as possible and quivers as it turns its underbelly toward its assailant. If one of the adversaries is clearly dominant, the skirmish is usually brief. If the aquarium offers no possibilities for escape or concealment, however, the situation can quickly turn dangerous. The mere presence of the defeated fish is seen by the victor as a challenge to continue fighting. In this case, you must intervene swiftly and decisively by removing the subordinate fish from the aquarium.

**The phases of combat:**

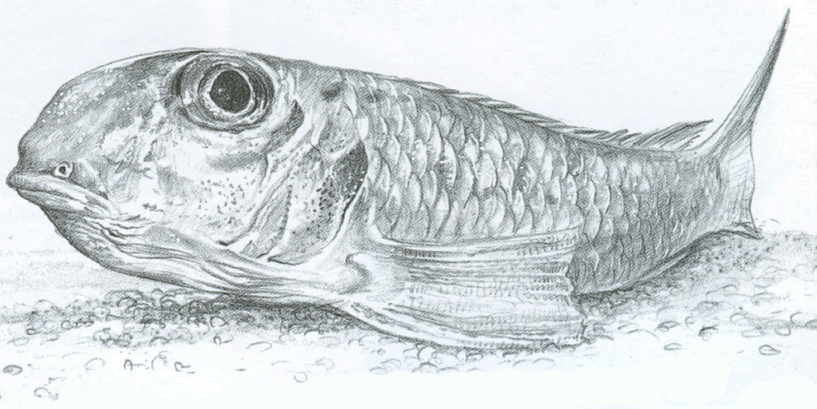
✔ Each battle begins with a threat. In its most harmless form, this involves swimming quickly and suddenly toward the opponent, swerving away at the last instant.

✔ If this maneuver fails to elicit submission and immediate flight, the next step is to assume an intimidating broadside posture. Each fish attempts to look as big as possible, spreading its fins and presenting its flank to the other. The intimidation phase culminates with a forceful wave of the tail, sending a surge of water toward the rival.

✔ If neither adversary gives in, mouth-to-mouth fighting may ensue. The cichlids grab each other by the lips and engage in a fierce tug-of-war, each seeking to force the other to flee.

✔ In a further escalation of battle, the fighting cichlids try to ram each other broadside. Here, as in mouth-to-mouth combat, they can do serious harm. In the worst case, such violent encounters can end in death.

Always keep in mind the enormous difference between the conditions in an aquarium and life in the wild. The more closely your cichlids are forced to live together, the more often disputes will arise. The best way to prevent excessive aggression is to give the fish ample room to live a full and normal life. This means that you should choose the largest possible aquarium right from the start.



***Female* Xenotilapia ochrogenys *"Ndole" with her offspring in her mouth.***

# BEHAVIOR GUIDE

***To give your Lake Tanganyikan cichlids proper care, you must know how to interpret their behavior.***

***This is what my fish are doing.***

***What does it mean?***

***Here's what to do!***

A bottom-dwelling cichlid eats algae.

Algae grazers need a vegetarian diet.

Feed them flakes containing green vegetable matter.

A *C. frontosa* female has a bulge in her throat.

She is incubating eggs in her mouth.

Prepare for young fry to emerge.

A pair of *T. moorii* swims in a circle.

The fish are ready to spawn.

Provide a secluded area for the female.

A female shell-dweller spends a good deal of time in her snail shell.

She might be tending a clutch of eggs.

Feed the hatchlings with baby brine shrimp.

Two shell-dwelling cichlids are threatening each other.

? They are fighting over territory or a snail shell.

! Add more snail shells to give them options.

A pair of *N. sexfasciatus* face off with open mouths.

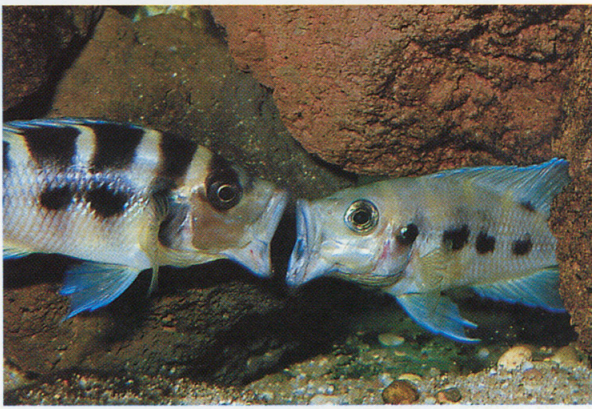
? They are preparing to fight or to spawn.

! Intervene to protect the weaker fish.

A featherfin male moves sand around.

? He is digging a spawning trench.

! Protect unreceptive females from the aggressive male.



A featherfin male constructs a crater.

? He awaits a spawning female.

! Feed the female well to promote formation of healthy eggs.

A *L. signatus* male engages in bold display in front of a snail shell.

? He is staking out his territory.

! Be alert for territorial disputes.

## Distinguishing the Sexes

For most Lake Tanganyikan cichlids, the sex of juveniles cannot be determined. Therefore, if you want to breed a particular species in your aquarium, you should purchase a sizeable group of healthy juveniles (see TIPS, pages 15 and 23) and raise them together. When they have reached sexual maturity, pairs will form, or you will be able to identify any visible differences between male and female:

✔ Among *Cyprichromis* and *Paracyprichromis* species (see page 29) and the featherfins (see page 26), the males are generally more brightly colored; in the case of *Cyphotilapia frontosa* (see page 23), males have a more prominent forehead bulge.

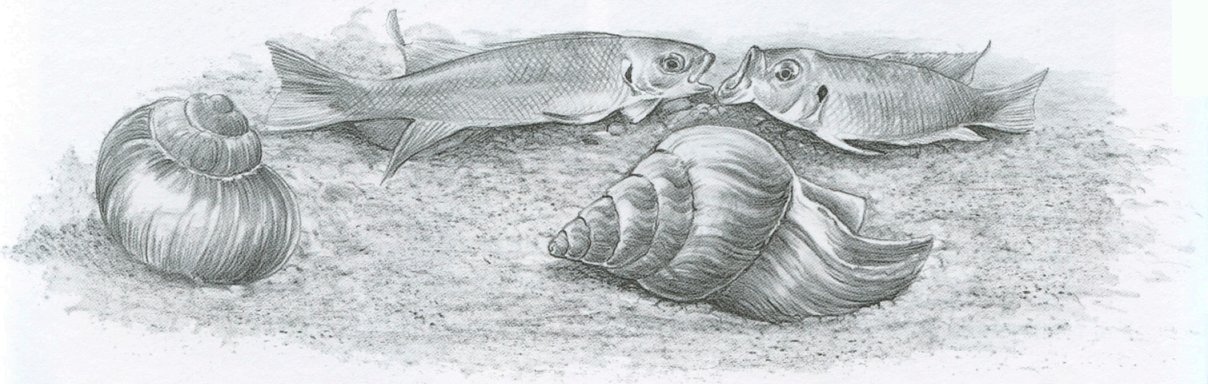
✔ For *Altolamprologus* species and the shell-dwelling cichlids (see page 14), it is evident early on that the females develop more slowly.

For most substrate spawners and the pair-bonding mouthbrooders, by contrast, only experienced dealers and breeders will be able to distinguish between male and female cichlids, even when the fish are fully grown; the identifying features are the different genital apertures. Lay aquarium enthusiasts must accept the fact that they cannot determine the sex of their fish with any reliability, at least initially. This makes it even more important to observe your cichlids' behavior carefully.

## Mating and Spawning Behavior of Mouthbrooders

Male mouthbrooders who are ready to mate stake out a territory around the future spawning site. At the edge of a crater, on a shelf of rock, or in a sandy trench, they lie in wait for receptive females. Other females and rival males are forcefully repulsed. If a receptive female approaches, however, the male will display himself, hovering broadside to the female with fins outspread. Then, with quivering or weaving motions, he coaxes the female to the spawning site. There the partners circle in a T formation and take turns lying on their side, vibrating as they present the belly to the other. After a few minutes, the female begins to lay eggs in this position; then she turns and takes the eggs into her mouth. At this point, the male releases his sperm, which the female likewise takes into her mouth. This mating

**Neolamprologus brevis** ***(right) and N. longior*** ***(left) do vehement battle.***



and spawning behavior differs at most in detail from species to species.

*Brooding* in most species falls to the female. From the day that the eggs are laid and taken up, a definite bulge appears in her throat. Young adults in particular occasionally have difficulty with mouthbrooding; they may swallow the eggs or spit them out. Normally, however, the juveniles are released after three to five weeks to seek their own food. In most species, for another week or two they can still seek shelter in the mother's mouth if danger threatens.

*Mouthbrooding* provides the juveniles with exceptionally good protection. As a result, the clutches are quite small. The extreme case is seen in the *Tropheus* species, which lay only 5 to 15 eggs.

## Mating and Spawning Behavior of Substrate Spawners

The substrate-spawning cichlids give the impression that they form close pairs, but often this is simply because of the constricted space in the aquarium. In fact, many species form pairs only during the breeding period. Pairs that are ready to spawn stay together almost continuously, in front of or above the intended spawning site. Their mating behavior is relatively inconspicuous, resembling aggressive behavior in many phases. The fish swim around each other, each nudging at the other's belly. Then the female, quivering, entices the male to the prepared breeding cave, where she deposits the eggs on the ceiling or walls. The male is often larger than the female, and in some species does not even fit into the rocky crevice or snail shell that serves as the spawning site. In that case, he releases his sperm at the entrance and the female swirls them over the eggs.

### Separating the Female Mouthbrooder

For many mouthbrooding cichlids, it is a good idea to separate the female toward the end of the brooding period, moving her from the community aquarium to a separate tank. This gives you an excellent opportunity to watch as she releases the hatchlings from her mouth. It also protects the juveniles from attack by hungry relatives and makes it easier to give them special food.

✔ Set up an aquarium with a capacity of 16 to 26 gallons (60–100 L), depending on the size of the species. Provide the basics: a sandy substrate, a few hiding places (such as clay flowerpots turned on their side), a heater, and a filter.

✔ Shortly before the end of the brooding period, remove the female from the community aquarium as gently as possible, preferably after the lights have been turned off for several hours and the fish are sleeping.

✔ Return the female to the community aquarium as soon as she has stopped tending the juveniles or starts to chase them. The larger the number of cichlids of the same species in the community aquarium, the more readily they will accept her return.

✔ Don't remove females of the *Tropheus* species to a separate tank. They will not be accepted back into the group, but rather will be vigorously repulsed.

*Sand-dwelling cichlids of the species* **Xenotilapia sima** *prefer to live in small groups—sometimes even in shoals.*

After spawning, in most species the clutch is guarded by the female. After about three days, the young emerge and attach themselves to the walls or ceiling of the cavity. Another 10 to 15 days pass before the juveniles appear at the entrance to the spawning site. Except for a few species, the parents do not tend the fry directly. They enjoy only indirect protection, in that they are allowed to stay within the fiercely defended breeding territory. How long they may remain differs from one species to another. Many juveniles become independent early on, whereas others stay sheltered until they are almost fully grown.

Substrate spawners have considerably larger clutches than mouthbrooding species; 50 to 100 eggs are the minimum, and larger species may lay several hundred eggs.

## Family Groupings

The basic processes of reproduction are practically identical among the substrate spawners on the one hand and among the mouthbrooders on the other. However, the family groupings within which the offspring are tended vary quite widely.

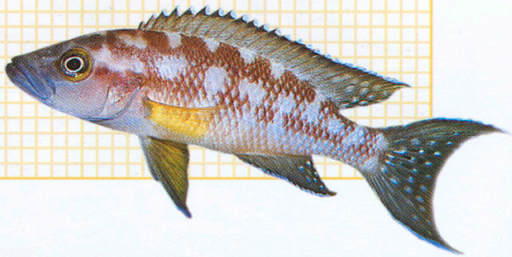
Among the *substrate spawners,* there are both species that bond in pairs (such as *Neolamprologus caudopunctatus)* and species that establish a harem (such as *Lamprologus callipterus).* In some cases, the males of pair-bonding species will mate with several females in succession if the opportunity arises (as in the genus *Julidochromis).* Many species (for example, *Neolamprologus brichardi)* form extended families in which several generations of juveniles are raised together. Often, these cichlids join to form colonies that may include many such extended families.

Among the *mouthbrooders,* the family situations are even more complicated. In most of the species that do not bond in pairs, the female deposits all her eggs at once in a single spawning act with a single partner. If she is disturbed, however, she may also swim away and continue to spawn at another site with one or more different males. Although relatively few mouthbrooding species form pairs at all, those that do are the ones with the most complicated brooding habits. In the case of *Xenotilapia spilopterus,* the female incubates the eggs for about 12 days, then transfers them to the male, who completes the brooding process. The parents of many species (such as *Reganochromis calliurus)* pass the eggs and larvae back and forth daily; in other species (for example, *Limnochromis auritus),* each parent carries half the offspring in its mouth for the entire brooding period.

No matter what distinctive habits the individual species have developed, observing the reproductive behavior of Lake Tanganyikan cichlids represents one of the peak experiences in keeping these fascinating fish.

## Checklist
### Breeding Substrate Spawners

1. **To promote successful breeding, give the parents only high-quality food.**
2. **Replace small amounts of water in succession, so that the temperature drops briefly and then rises again.**
3. **Provide an ample selection of suitable breeding cavities.**
4. **Create visual screens (see page 58) in the aquarium, so that the partners are not always within sight of each other.**
5. **Prepare an additional aquarium [with a capacity of 26 gallons (100 L) or more] for raising the juveniles or for separating a fighting pair.**
6. **Be prepared to hatch out baby brine shrimp (see page 44) in time to feed the juveniles as soon as they are free swimming.**
7. **Remove the juveniles to safety if they are attacked or the parents have stopped spawning.**



# HOW-TO: BREED CICHLIDS

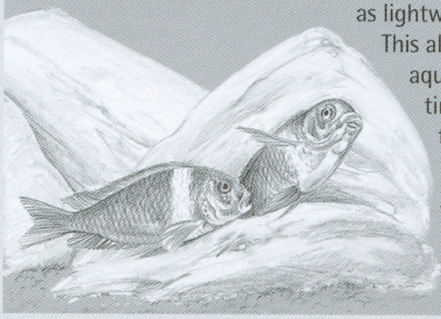
Most Lake Tanganyikan cichlids will reproduce right in the display aquarium where they normally live. In that case, it's a good idea to provide a pile of small stones (2–4 inches, 5–10 cm), in the center or foreground of the aquarium where the juveniles can escape their predatory relatives. If you do this, a few of each clutch will survive. If you want to raise a certain species in greater numbers, however, you should set up a special aquarium.

**Breeding Aquarium for Substrate Spawners**

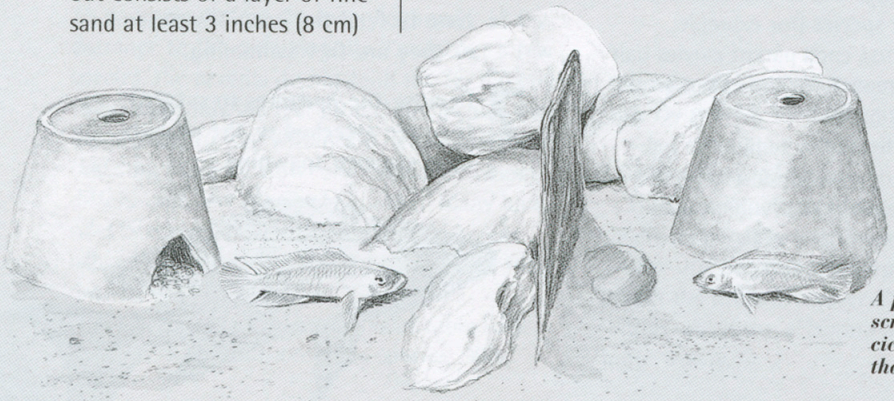
An aquarium for breeding substrate spawners should hold at least 26 gallons (100 L)—for larger species, considerably more. The depth of the tank is more important than its height, so that aquariums with an almost square base are often used. The layout consists of a layer of fine sand at least 3 inches (8 cm) deep—allowing the fish to dig into the substrate—and a number of cavities constructed of layered flat stones, concave roofing tiles, or flowerpots (see page 36). Do not use wood. In the middle of the aquarium, place a large, flat rock (such as a piece of slate) upright in the sand, forming a visual barrier between the structures in the right and left halves of the tank. This helps reduce aggressive behavior between partners.

**Breeding Aquarium for Mouthbrooders**

Depending on the size of the mouthbrooding species, you need a tank with a capacity of at least 66 gallons (250 L). If an internal filter is not built in, install a powerful motor-driven filter. For decoration, 2 inches (5 cm) of fine sand and a few layered lava rocks, concave roofing tiles, or inverted flowerpots will suffice. The structures do not need to be particularly attractive, but they should be as lightweight as possible. This allows you to strip the aquarium in a short time when you need to remove the fish.



*A good spawning site for mouthbrooding species that prefer a rocky habitat offers protection in several directions.*



*A piece of slate screens the female cichlid's shelter from that of the male.*

In an aquarium like this, you can maintain and raise an entire extended family or colony of a single substrate-spawning species. If the aquarium is large enough, you can even breed two different species, but in that case it's best to choose two quite dissimilar species. It's also possible for substrate spawners to share an aquarium with mouthbrooders, as long as they are not algae grazers. Algae grazers and substrate spawners have such different dietary requirements that it would be impossible to provide optimal nutrition for each—and that is absolutely necessary for successful breeding.

**Gathering Juveniles**

If your breeding program is successful, you will need to remove juveniles from the aquarium from time to time. It's best to do this in the morning, just after the lights go on. Quickly but carefully, remove all the objects from the tank. With a large hand-net, and as gently as possible, collect the juveniles and place them in a second aquarium, which must have exactly the same water temperature as the breeding aquarium. Then immediately return the structures in the breeding aquarium to their original locations. Try to place them exactly as they were before; this will help minimize the aggressive behavior that almost always occurs in the parent cichlids after such an intervention.

**Feeding the Juveniles**

Whether in the community aquarium or in a breeding tank, when female mouthbrooders release their young or juvenile substrate spawners first emerge from their nursery you must be ready to feed them freshly hatched baby brine shrimp. If you monitor your cichlids carefully, you will be able to predict this moment fairly accurately and be ready. Introduce the live baby brine shrimp with a syringe and tube (see page 44) in the immediate vicinity of the juveniles—for best results, do this in several small servings, because the shrimp are quickly carried off by the current. In a smaller tank, you can adjust the pump of the filter in so that the current carries the food from the surface and directly under flat rock shelters. As a result, a stream of shrimp will swim right past the mouths of the timid young cichlids who like to shelter in these protected areas. Especially in the first days and weeks, a regular and abundant supply of food is essential to the health of the juveniles. At the same time, be sure to maintain optimal water conditions and change the water carefully at regular intervals.

*These rock structures provide a safe feeding area for timid young cichlids, especially if the filter pump directs the flow of food in that direction.*

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***Shell-dwelling cichlids (here,* Telmatochromis burgeoni*) will also occupy larger snail shells (such as those of marine snails).***

# INFORMATION

The following resources have been compiled to give you access to a wide ranging network of information and expertise on aquarium topics in general and on Lake Tanganyika cichlids specifically. As you progress in your hobby you will meet many people who will also be anxious to help you. The dealer from whom you purchase fish and supplies is likely to be a great source of advice and information. If you decide to join any of the clubs or societies listed in this section, you will make the acquaintance of experienced enthusiasts who take pleasure in bringing along new people in the hobby.

The growth of the Internet has also impacted fish keeping and you will discover a world of information just a mouse click away. The extent you will pursue this venerable, fascinating hobby is up to you. What follows will help you decide.

## Magazines

*Aquarium Fish*
Fancy Publications
Subscription Department
P.O. Box 53351
Boulder, CO 80323-3351

*Cichlid News*
Aquatic Promotions, Inc.
P.O. Box 522842
Miami, FL 33152
305-593-0088

*RCM Publications*
Freshwater and Marine Aquarium Magazine
144 West Sierra Madre Boulevard
Sierra Madre, CA 91024

*Tropical Fish Hobbyist*
TFH Publications, Inc.
One TFH Plaza
Neptune, NJ 07753

## Journals

*Ichthyological Exploration of Fresh Waters*
Verlag Dr. Friedrich Pfeil
P.O. Box 65 00 86
D – 81214, Munich, Germany

## Books

Brichard, Pierre. *Book of Cichlids and All the Fishes of Lake Tanganyika.* Neptune, New Jersey: TFH Publications, 1989.

Konings, Ad. *Back to Nature Guide to Tanganyika Cichlids.* Jonsered, Sweden: Fohrman Aquaristik AB, 1996.

Loiselle, Paul. *The Cichlid Aquarium;* Blacksburg, Virginia: Tetra Press, 1994.

Smith, Mark Phillip, *Lake Tanganyikan Cichlids.* Hauppauge, New York: Barron's Educational Series, Inc., 1998.

Tullock, John H., *Dictionary of Aquarium Terms.* Hauppauge, New York: Barron's Educational Series, Inc., 2000.

Zurlo, Georg, *Cichlids.* Hauppauge, New York: Barron's Educational Series, Inc., 1991.

## Book Sellers

Aquatic Book Shop
P.O. Box 2150
Shingle Springs, CA 95682-2150
916-622-7157

Cichlid Press
4170 Valplano Dr.
El Paso, TX 79912

Aquatic Promotions, Inc.
P.O. Box 522842
Miami, FL 33152

**Cichlid Clubs (United States)**
American Cichlid Association
524 Prairie Knoll Drive
Naperville, IL 60565

Pacific Coast Cichlid Association
P.O. Box 28145
San Jose, CA 95128

Greater Chicago, Cichlid Association
41 West 510 Route 20
Hampshire, IL 60140

**Cichlid Clubs (International)**
**England**
British Cichlid Association
248 Longridge, Knutsford
Cheshire, WA18 8PH

**France**
Association France Cichlid
15 Rue des Hirondelles
F-67350 Dauendorf

**Germany**
Deutsche Cichliden Gesellschaft
Parkstrasse 21A
D-33719 Bielfeld

**Netherlands**
Nederlandse Cichliden Vereniging
Boeier 31
NL-1625 CJ Hoorn

**Internet Sites**
American Zoos and Aquariums
*http:///.aza.org*

Aquatic Book Shop
*http://www.seahorses.com*

Cichlid Press
*http://www.cichlidpress.com*

The Cichlid Room Companion
*http://www.petsforum.com/cichlidroom/default.html*

Fish Information Service (FINS)
*http:///www.actwin.com/fish/index.html*

## Aquarium Societies

Boston Aquarium Society
255 Central Street
Boston, MA 01746

Brooklyn Aquarium Society
P.O. Box 290610
Brooklyn, NY 11229

Bucks County Aquarium Society
1668 Hatboro Road
Richboro, PA 18954

Canadian Society of Aquarium Clubs
95 East 31st Street
Hamilton, ON
L8V 3N9 Canada

Federation of American Aquarium Societies
(Membership Information)
4816 East 64th Street
Indianapolis, IN 46220-4828

North American Fish Breeders Guild
(Membership Information)
RR #2, Box 67-L
Orangeville, PA 17859

Tampa Bay Aquarium Society
11308 Donnymoor Drive
Riverview, FL 33569

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Nieuwenhuizen: inside front cover, pages 16 bottom right, 48;
Werner: page 61.

## Photos on Book Cover, Title Page, Chapter Title Pages:

Front cover: *Cyprichromis leptosoma* (large photo), *Neolamprologus cylindricus* (small photo).
Back cover: *Julidochromis dickfeldi.*
Page 1: *Tropheus duboisi.*
Pages 2–3: *Lepidiolamprologus kendalli.*
Pages 4–5: *Julidochromis dickfeldi.*
Pages 6–7: *Neolamprologus furcifer.*
Pages 64–65: *Altolamprologus compressiceps.*

**Important Note**

Electrical equipment for the maintenance of aquariums is described in this book (see page 34). To prevent dangerous accidents, please be sure to follow the manufacturer's instructions for installation and safe use. Water damage resulting from broken glass, overflow, or tank leaks cannot always be avoided. Be sure to obtain insurance against such accidents (see page 33).

Keep all fish medications out of reach of children.

## About the Author

Georg Zurlo has bred and photographed cichlids for more than 25 years. He is especially interested in the species of Lake Tanganyika. He frequently writes articles about cichlids for specialized journals. He is a member of the editorial staff of the magazine *das Aquarium,* and has responsibility for translating and editing books and articles about aquarium science. For several years, he has enjoyed skin-diving as a means of researching the underwater world.

## About the Artist

Johann Brandstetter was educated as a restaurateur and painter. After research expeditions with biologists in Central Africa and Asia, he became a graphic artist, specializing in plants and animals. He has provided illustrations for renowned nature book publishers in Germany for many years.

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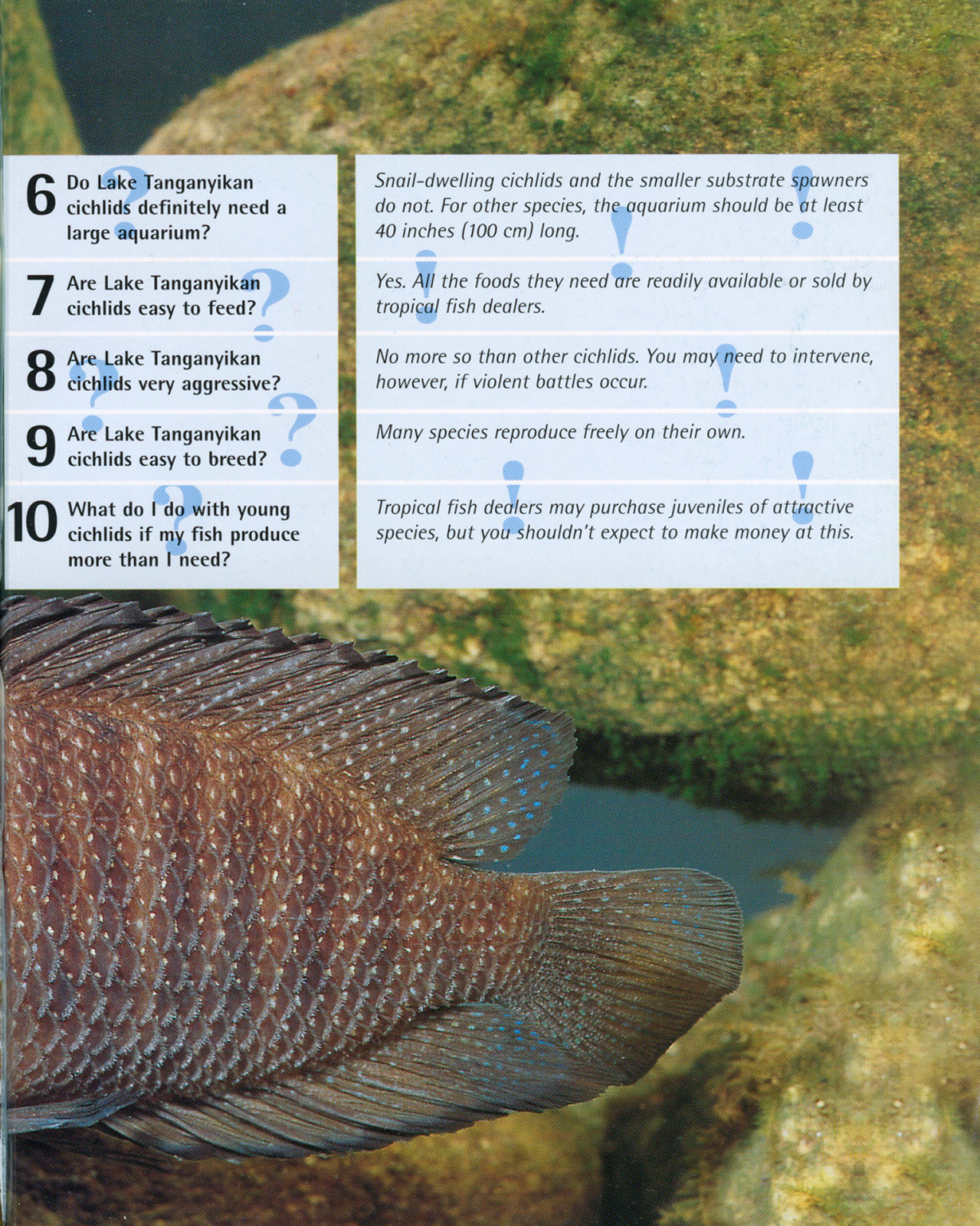
# ASK THE EXPERTS

| | |
|---|---|
| **1** Are Lake Tanganyikan cichlids suitable for novices? | *Many species are not particularly demanding, but some experience with aquariums would be helpful.* |
| **2** Can these fish be kept in a community aquarium? | *Some of the smaller substrate spawners could, but their interesting behavior won't be seen unless they live with other Lake Tanganyikan cichlids.* |
| **3** Are Lake Tanganyikan cichlids expensive? | *Only rare species, especially if wild-caught. Most captive-bred cichlids are not expensive.* |
| **4** Where can I purchase Lake Tanganyikan cichlids? | *At almost any pet store; also through specialized dealers, breeders, or cichlid clubs (see page 62).* |
| **5** Must tap water be treated for Lake Tanganyikan cichlids? | *Not if the pH is above 7.5 and the water is at least moderately hard. It's very important, however, to change the water regularly (see page 39).* |

***Experts answer the ten most common questions about Lake Tanganyikan cichlids.***



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|---|---|
| **6** Do Lake Tanganyikan cichlids definitely need a large aquarium? | *Snail-dwelling cichlids and the smaller substrate spawners do not. For other species, the aquarium should be at least 40 inches (100 cm) long.* |
| **7** Are Lake Tanganyikan cichlids easy to feed? | *Yes. All the foods they need are readily available or sold by tropical fish dealers.* |
| **8** Are Lake Tanganyikan cichlids very aggressive? | *No more so than other cichlids. You may need to intervene, however, if violent battles occur.* |
| **9** Are Lake Tanganyikan cichlids easy to breed? | *Many species reproduce freely on their own.* |
| **10** What do I do with young cichlids if my fish produce more than I need? | *Tropical fish dealers may purchase juveniles of attractive species, but you shouldn't expect to make money at this.* |

# Information and advice to help you take good care of your aquarium

**Typical Lake Tanganyika Cichlids in captivity:** anatomy, origins, traits, and life cycle

**Expert advice:** maintaining optimal water chemistry and temperature

**Understanding Lake Tanganyika Cichlids:** special needs, compatibility with other varieties, and more

These colorful, fascinating fish will thrive when you provide them with the correct aquatic environment.

- Step-by-step directions for setting up and maintaining your aquarium
- Informative, easy-to-understand checklists and sidebars
- Filled with handsome full-color photos

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